

NEW ZEALAND
JOURNAL OF
Agriculture
APRIL
1948



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This month's cover



Though New Zealand is essentially a pastoral country and emphasis in the Aid for Britain campaign has been placed on increased production of meat and dairy produce, arable farmers have an important part in the campaign in meeting the Dominion's obligations in cereal production by reaching the production targets set for 1948-49. This month's cover, painted by L. C. Mitchell from a photograph by Geo. Chance, F.R.P.S., Dunedin, shows a ploughing scene on a farm near Willowbridge, Canterbury, the principal arable-cropping province of New Zealand. Nowadays about four-fifths of the Dominion's wheat crop, half the national acreage of oats, and about three-fifths of the total acreage of barley are grown in Canterbury.

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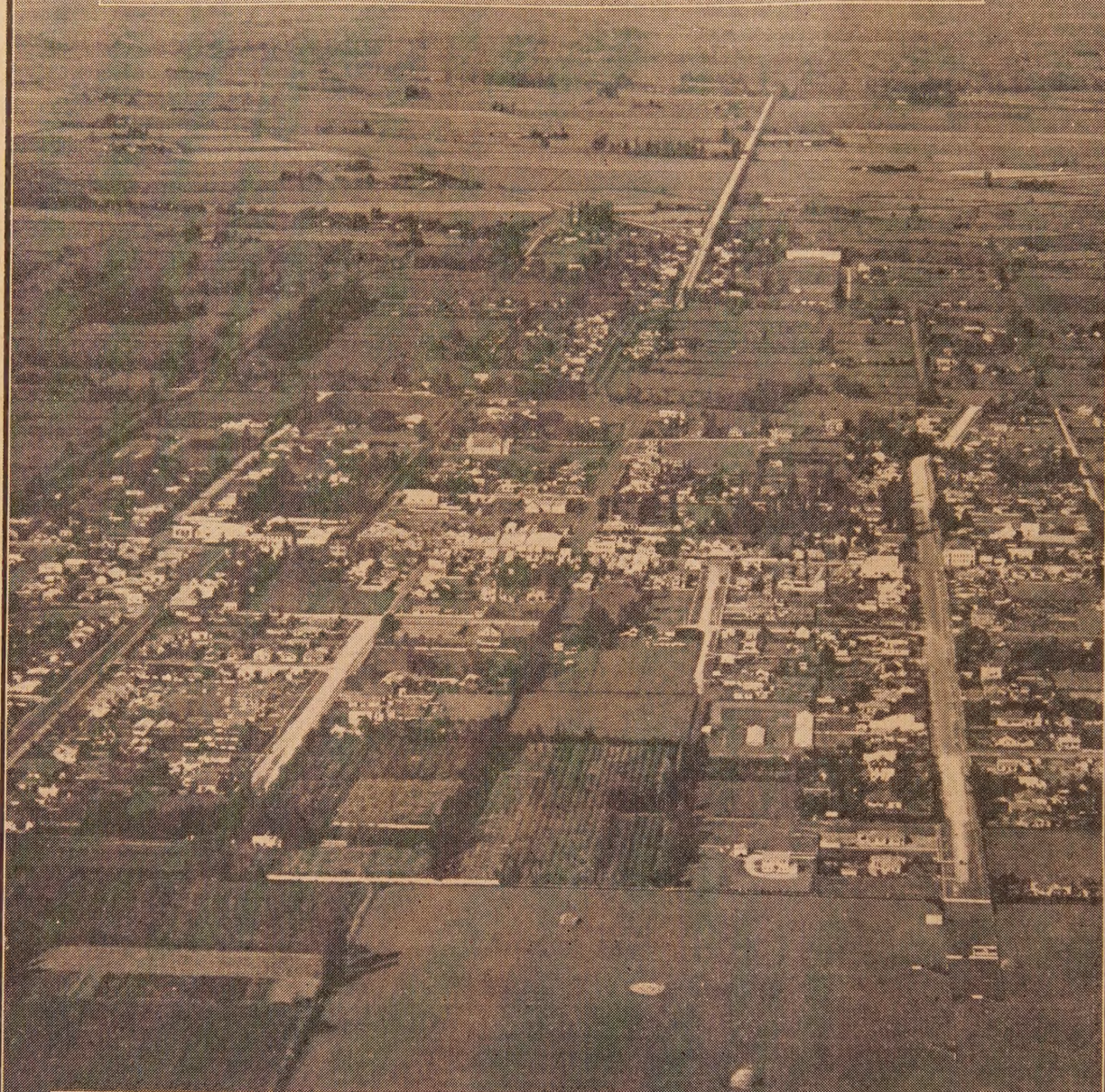
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RANGIORA IN NORTH CANTERBURY



Although only 20 miles north of Christchurch, Rangiora is an important centre for the extensive farming district of North Canterbury. It serves an area composed of some fertile silt flats, foothills, and extensive light land on which sheep farming and grain and small seeds production form the most important industries. Dairying for town milk supply is also prominent in Rangiora County.

Irrigation Research in Canterbury



THOUGH most of New Zealand has a fairly well-distributed rainfall which is almost ideal for grassland farming, there are districts in the South Island where long dry spells occur and where irrigation water must be applied for the land to be fully productive. This system of farming is becoming more important, but its increase

depends largely on major engineering schemes fostered by the Government and the use made by farmers of the facilities available. During the 1946-47 season 85,437 acres were irrigated in the Dominion and 110,562 acres were prepared for irrigation.

During the past few years the area on which irrigation water can be applied has been appreciably increased by the construction of a large combined hydro-electric and irrigation scheme in mid-Canterbury, serving 68,000 acres of light plains land. Several extensions of this scheme will ultimately allow a total of 420,000 acres to be served by irrigation water.

I anticipate that with proper use of water in these relatively-dry districts production is likely to increase very considerably during the next few years, because the value of irrigation has already been demonstrated not only overseas but also in parts of Central Otago, where farm production depends on irrigation water. Though conditions there are normally more arid than those of Mid-Canterbury, where a type of farming can be practised without irrigation, an experiment carried out by my Department in collaboration with the Public Works Department showed that on 47 acres of irrigated pasture over a seven-year period the normal carrying capacity was considerably increased. It was shown that permanent, high-producing pastures with a close sward were possible on this light land under irrigation, and the expense of resowing pastures every three years would be obviated.

To obtain further information on the effects of irrigation on a large scale the Government has established an Irrigation Research Station on a property of 760 acres near Ashburton. The farm was taken over in September, 1946, and, though typical of the district in soil type, it consisted in the main of run-out pastures which would require breaking up and resowing before irrigation could be started. The development of the property therefore has not been easy, but any results which may be obtained will at least be applicable to properties of initial low fertility, and studies of soil improvement will also have an advantage in that respect.

A portion of this area has been set aside as a self-contained mixed farm of 350 acres where irrigation will be developed on a scale similar to that of the normal farm in the district and on which about half the area will be watered each year. It is intended

to bring this farm to that stage as rapidly as possible and by next December to have more than half the area in good pasture or lucerne, which will be irrigated. Though the experiment referred to previously has amply demonstrated the increased carrying capacity likely from irrigating one or two fields, and farmers are urged to take every advantage of irrigation water where it is available, information is urgently needed about the likely benefit of irrigation on a large scale as a further lead to those who have already introduced the practice on to their farms.

As a means to encouraging the dairy industry in Mid-Canterbury, the Government has set aside another portion of the property as a self-contained dairy farm of 150 acres in order to investigate the possibilities of dairying under irrigation in the district. Though 40 acres on this portion had been sown in pasture and prepared for irrigation just before the property was taken over, the establishment of dairying pastures and the provision of the necessary subdivisions, water supply, and farm buildings could not be completed in time for full-scale dairying to begin last year. However, it is expected that this farm will be fully devoted to dairying at the start of the next season.

The remainder of the property will be used for fundamental irrigation research, and plans have been made for the erection of a laboratory where chemical and physical studies of soil and plant material can be carried out in conjunction with field work. Tests will be made of various water-spreading devices, cultivation and levelling practices, and species and strains, and the whole relationship between irrigation and soil fertility studied.

Moreover, officers of my Department will maintain close contact with farmers' irrigation problems in all districts so that the research work may be fully applicable to farm practice. An advisory committee has been set up consisting of representatives of the Departments of Agriculture, Public Works, Lands and Survey, and Scientific and Industrial Research, of Canterbury Agricultural College and the Canterbury Progress League, and three irrigating farmers. Thus most of those interests concerned with irrigation research will be represented, and such a committee should ensure that all the problems of irrigating farmers are brought to the station for investigation. Similarly, the results of the research work are more likely to become known and put into practice when they are sponsored and followed through by representatives of the local farming community. This committee has been active for more than 12 months and has already been exceedingly useful in guiding the initial stages of development of the station.

I confidently expect that in future the work of the station will be of great benefit to all farmers throughout the Dominion who undertake irrigation on their farms.

EDWARD CULLEN, Minister of Agriculture.

Work of the Food and Agriculture Organisation

THE Food and Agriculture Organisation of the United Nations has been of special interest to New Zealand not only because of this country's essentially agricultural economy but also because the Director-General of Agriculture, Mr. E. J. Fawcett, from the outset has played a prominent part in the affairs of the organisation. Mr. Fawcett was for two years a member of the executive committee until the Geneva Conference last September, when that body was replaced by the Council of FAO. At the Copenhagen Conference in September, 1946, Mr. Fawcett was one of the three vice-chairmen. For some 14 months from February, 1947, Mr. Fawcett had his headquarters in London and was fully occupied in attending FAO executive meetings, special conferences, and meetings of the preparatory committee establishing an International Trade Organisation.

THE Food and Agriculture Organisation was established in 1945 following on the Hot Springs Conference on world food problems two years previously. Its main objectives were the establishment of the dietary needs of the peoples of the world and the correlation of the production of food to these nutritional requirements. To achieve these ends it was necessary to promote in all possible ways the scientific development of agricultural production and to assist in organising the world's marketing and distribution machinery for handling agricultural produce.

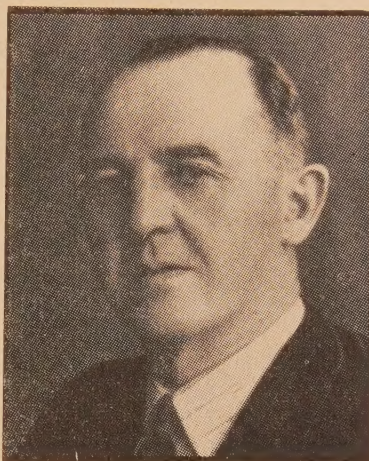
FAO's work in the dissemination of technical knowledge has been reasonably straightforward, and during its existence the organisation has published a number of papers on technical questions, investigated such problems as the infestation of stored foodstuffs, and sent missions to several agriculturally-backward or war-devastated countries to advise them on agricultural development and reconstruction.

In the sphere of world economics and the marketing and distribution of produce FAO has had a much more difficult trail to blaze, the task not being made any easier by the state of political uncertainty in practically all of Europe and the precarious economic position of the leading European countries.

World Food Proposals

Appreciation of this difficult situation inspired the then Director-General, Sir John Boyd Orr, to issue in 1946 his World Food Board proposals. These were considered at the Copenhagen Conference in September, 1946, and a special commission known as the Preparatory Commission on World Food Proposals was set up to investigate the whole question. This commission sat for several months and issued its report in January, 1947.

It recommended the establishment, not of a World Food Board, but of a World Food Council of 18 members generally to administer the production and distribution of world supplies of food and raw materials. The commission was convinced of the desirability



Mr. Fawcett.

of preventing, as far as possible, that disturbing instability of prices which characterised the period between the wars. To achieve this it was considered that the most satisfactory method would be by intergovernmental commodity arrangements and agreements. It was also proposed that these agreements provide for the creation of a famine reserve of basic foods held nationally for use internationally, and the establishment of limited price stabilisation reserves or buffer stocks for commodities subject to seasonal and cyclical fluctuations. Among other recommendations was one for the sale of agricultural surpluses at special prices to countries in need but lacking the foreign exchange to buy their full requirements. At the 1947 FAO Conference at Geneva the preparatory commission's recommendations formed the basis of much of the discussion.

International Trade Organisation

During the first seven months of 1947 there had taken place, first at New York and later at Geneva, meetings of the preparatory committee established by the United Nations to consider the

establishment of an International Trade Organisation with general objectives wider in scope but similar in many respects to those of FAO. The report of this committee advocated commodity studies and commodity agreements under the aegis of specially-constituted commodity councils.

It was probably with this development in mind that the 1947 conference recommended the establishment, not of a World Food Council, but of a Council of FAO, composed of 18 member nations elected by ballot, with objectives similar to those envisaged by the preparatory commission. As New Zealand has had two years' representation on this executive committee, Australia has now been elected to act on the new council. It is expected that this position will alternate between Australia and New Zealand on a three-year term of office.

This council was elected at the conference in September and held its first meeting from November 4 to 11. Its immediate tasks are concerned with short-range problems of food shortages, and one of its most important acts was the absorption of the functions of the International Emergency Food Council, which now becomes a committee of the Council of FAO. Other recommendations ranged from short-term problems of foreign exchange, fertilisers, farm machinery, and other requisites of production to long-term problems of agricultural-industrial expansion. A committee was established known as the Policy Committee on Production and Distribution, which, working with the staff of FAO, will secure all possible information on the individual production plans of member nations. In general commodity policy the council's activities are taking the form of recommending the maximum utilisation of available supplies, particularly milk products and cereals.

Future of FAO

At present any prophecy about the future of FAO is difficult and in any case unwise. It is essential for the future stability of the world that the United Nations Organisation and its agencies should function among the democracies, and FAO can play its part. It is of importance that recently 36 nations signed a five-year international wheat agreement containing some startling departures from orthodox procedure, but in line with the principles advocated by FAO.

If FAO in collaboration with the International Trade Organisation can establish further intergovernmental commodity agreements of a similar type to the wheat agreement, it will undoubtedly have an important future in the realms of international economics. It is hoped that the organisation may eventually assume a role in relation to food and agriculture synonymous with that held by the International Labour Office in the field of labour and employment.

The Bottling of Market Milk

FURTHER stages in the story of market milk on its way to the consumer are described in this article, the third of a series by T. P. J. Twomey, Superintendent of Market Milk Production, Dairy Division, Wellington. It deals principally with the manufacture, cleaning, filling, and delivery of milk bottles. The first two articles appeared in the December and January "Journals" and the series will be concluded next month.

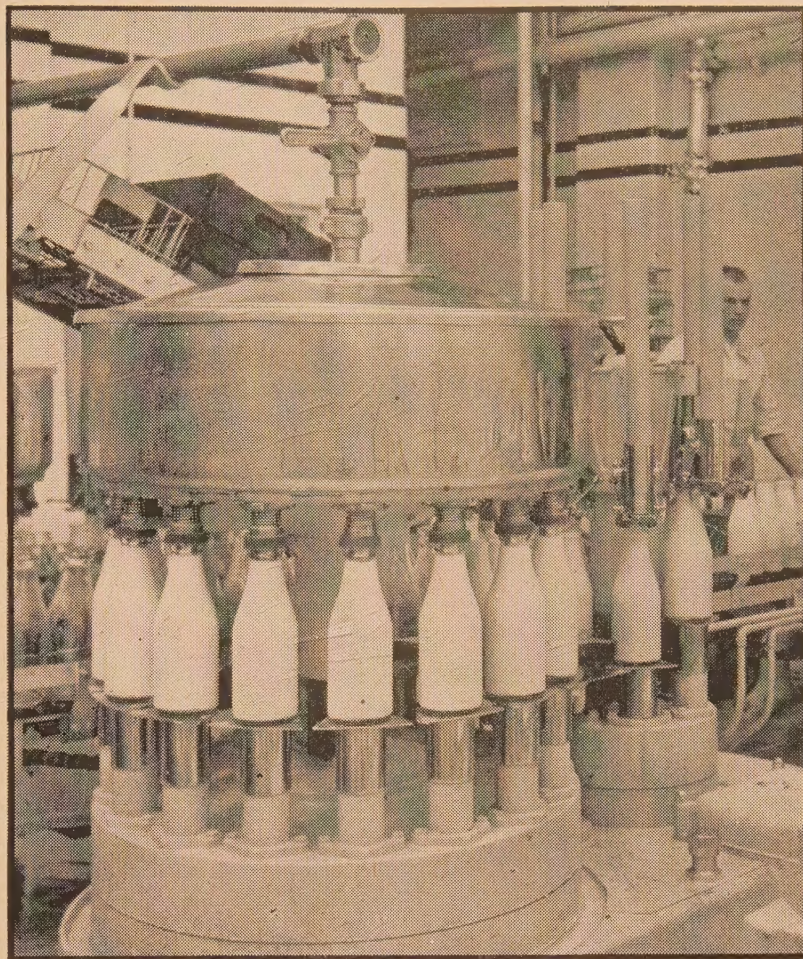
AFTER the milk has been filtered and pasteurised it is cooled to about 40 degrees F., flows to holding tanks, and is held there until required for bottling and dispatch. In most milk-treating houses the bottling process runs parallel to the pasteurisation process, so that in effect the milk continues straight through the holding tanks into the bottling machines. If it is to be held in the tanks for any length of time, it must be kept in a state of continual agitation to prevent the cream rising to the top of the milk; if that were allowed to happen, some bottles would get all the cream and some bottles all the more watery part of the milk.

To watch the bottle-filling and washing machines at work in a modern town milk plant is fascinating. The bottles—thousands of them every hour—disappear dirty into the washers and emerge in serried ranks, sterile, sparkling, and cool, to follow each other in an endless chain to the filling machines, where they march up one by one to be filled and capped. Then they proceed to the cool store, where they await their turn for collection and ultimate delivery to someone's breakfast table. The whole scene is one of noisy but ordered activity.

Popularity of Bottles

Though many types of containers are used throughout the world for holding milk for retail sale, none has attained a wider popularity than the glass bottle. This type of container is cheap, attractive, robust, and, being easily sterilised, can be used many times over. It has the further advantage for the customer that the contents can be clearly seen before purchase.

Glass bottles have been used for the commercial distribution of milk for some 70 years. The earlier types were fitted with "swing stoppers," but after the introduction of the disc closure in 1889 the older type of bottle rapidly disappeared. Strange as it may seem today, milk bottles were looked on with some suspicion when they were



[National Publicity Studios photo.]
Bottles being filled at the Wellington Municipal Milk Department's premises. The condensation forming on the bowl is caused by the extreme coldness of the milk being fed to the bottles.

first introduced. Many customers could not get out of their heads the idea that bottled milk was akin to medicine, because glass bottles were then, as they are now, very widely used for the packaging of medicine.

No doubt the attitude to bottles then was rather like the attitude to pasteurised milk in New Zealand today. It is human nature to resent the introduction of something too new, and time is needed for such articles to wear down the antagonism which some customers seem to maintain against any innovation.

However, the public of America had overcome their suspicion of milk bottles sufficiently well by the second decade of this century to enable most cities in the United States to pass ordinances making it compulsory that milk should be sold

in bottles and to prohibit the sale of milk loose into billy-cans or similar containers supplied by the customer. In England and on the Continent milk bottles had reached favour and were being widely used early in the century, but in New Zealand the introduction and widespread use of milk bottles have followed a slower path, and even now quite a large proportion of milk in New Zealand—and in big towns, too—is sold loose into billy-cans, a method which is condemned by every progressive dairyman and public health official.

Bottles used for milk are made of lime glass, the three major constituents of which are soda ash, limestone, and silica sand. The proportions vary somewhat, but in general they are:—

Soda ash	..	13 to 16 per cent.
Limestone	..	8 to 14 per cent.
Silica sand	..	68 to 74 per cent.

THE MAKING OF A MILK BOTTLE



Fig. 1.

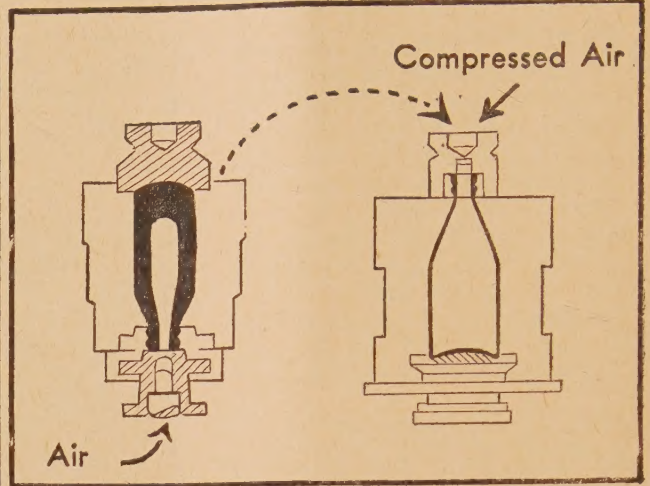


Fig. 2.

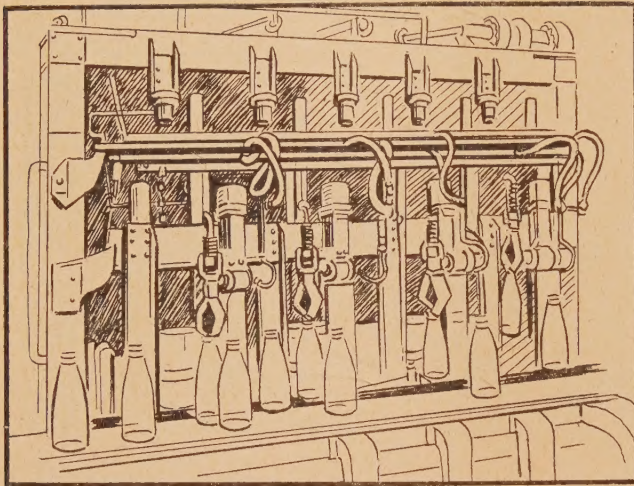


Fig. 3.

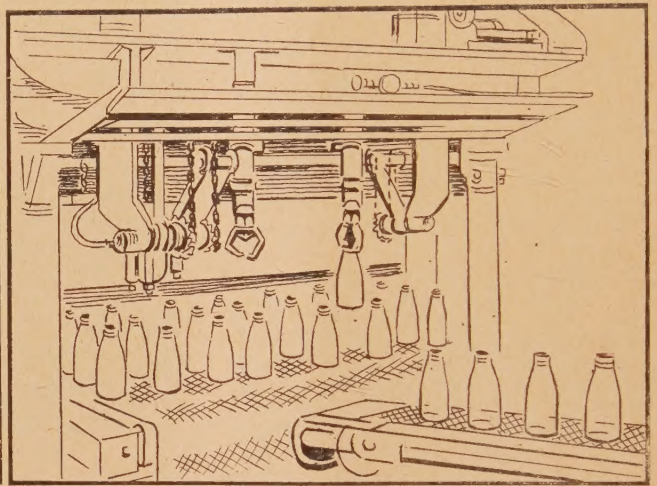


Fig. 4.

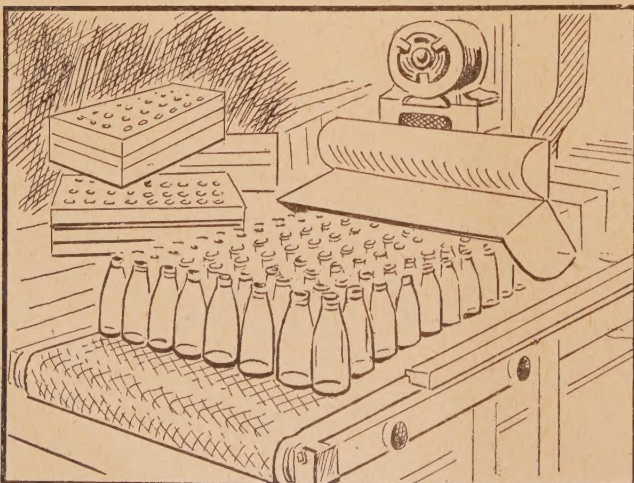


Fig. 5.

Milk-bottle glass is made from white sand, soda ash, limestone, feldspar, and saltpetre. These are mixed together in the correct proportions and fed through a hopper into the glass furnace, where the heat reduces the mixture to molten glass. The furnace is heated by coal gas made at the plant so that the gas is fed to the furnace while still hot.

The molten glass flows through the furnace and is fed to bottle moulds in regulated amounts. The bottles are formed in the moulds by the action of compressed air, and the whole job is completely automatic. The type of machine illustrated in Fig. 3 can make 37,000 bottles a day, working day and night.

From the bottle-making machine the bottles, still red hot, are lifted automatically and placed on a conveyer belt which moves slowly through an annealing oven, where the bottles are cooled down slowly and carefully before being delivered for inspection and packing.

Fig. 1 shows the sand mixture being fed from the hopper into the top of the furnace, Fig. 2 the bottle being blown in the mould, Fig. 3 part of the bottle-making machine, Fig. 4 the bottles being fed into the annealing oven, and Fig. 5 the bottles cooled and annealed ready for inspection and packing.

THE BOTTLING OF MARKET MILK

The careful choice and mixing of these ingredients are highly important, as glass for bottles is made now in a furnace which is working continuously, and any serious deviation from a formula can have expensive results. When melted the prepared mix must be suitable for the economical and rapid manufacture of bottles by the modern types of automatic machine. The finished bottle must be made of a glass which will resist wear or scratching when it is immersed in alkaline solutions (such solutions are used in bottle washers) and will have adequate resistance to breakage or shattering when it is immersed in very hot water or taken out of hot water and immersed in very cold water. Usually a good milk bottle will be able to stand a temperature difference of up to 80 degrees F.

The capacity of a milk bottle is highly important, as in most modern automatic bottle-filling machines the capacity of the bottle determines the measure of the milk—that is, the machine will deliver only as much milk as the bottle will hold. These types of filling machines are said to work on the bottle-as-measure principle.

Wording or lettering on bottles can be arranged in any of three ways. The most common is to have the lettering embossed on the bottles by including the embossing in the cutting of the mould which shapes the bottle. Another method is to etch or sandblast the wording on to the glass, and the third method, which is very popular overseas, is to apply coloured lettering to the bottle after manufacture by a special enamel which is fused on to the glass by heat. The coloured wording looks very attractive, and when it is done on well-made bottles by proper machines is of remarkable durability.

Sizes and Shapes

In New Zealand milk is bottled in quart, pint, and half-pint containers, and in England there is also a third-



[Sparrow Industrial Pictures Ltd. photo.]

The combined feed and delivery end of a "come-back" type of bottle-washing machine. Dirty bottles are taken from crates in front of the operator and placed on the lower ledge of the washer. They travel through the machine and emerge on the top ledge (the ends of a row about to be delivered are just visible), where they land on a conveyer belt which takes them to the filling machine at the left to be filled and sealed. The dials over the machine indicate temperatures and pressures within the machine, enabling the operator to control the efficiency of the washing process.

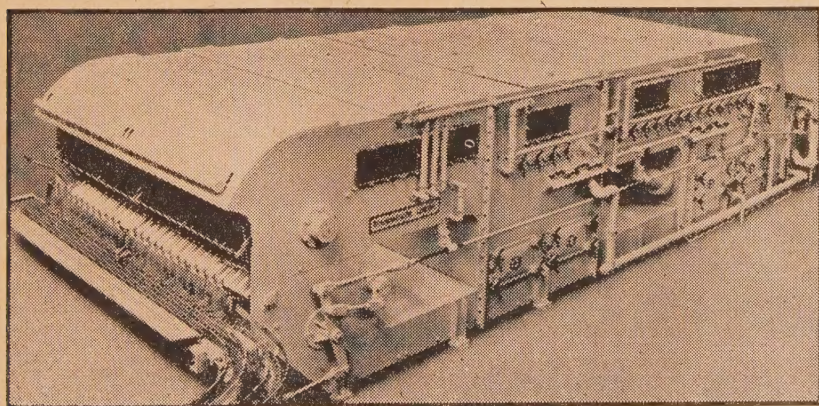
pint size, which is used exclusively for schools. In America the sizes used include half-gallon, quart, one-and-a-half pint, pint, and half-pint. In Europe, where the metric system of measurement is universally used, the standard-sized bottles hold one litre, half a litre, or a quarter of a litre, a litre being roughly equivalent to a quart. In Ceylon milk is sold in bottles holding one and one-third pints.

The shapes of milk bottles in various parts of the world are many, but New Zealand has adhered to a style very

similar to that in use for many years in Great Britain. In America, however, a multitude of shapes has claimed varying degrees of popularity, and the latest to catch the popular fancy is the square, though it is not truly square, as the sides are made slightly bulging, enabling the inside corners to be slightly rounded. No difficulty has been experienced in washing this type of bottle.

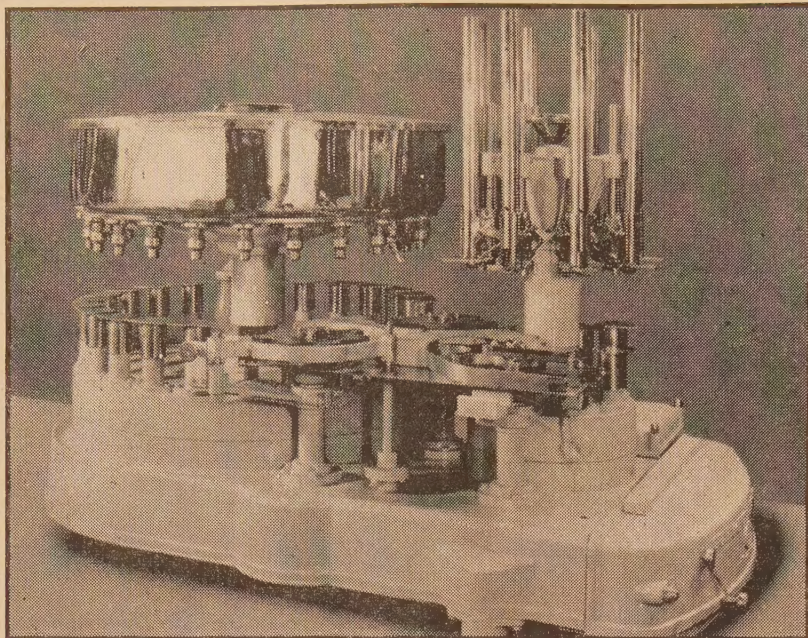
The square bottle is being used to a limited extent in England but to quite a wide extent in America. However, present indications are that this type of bottle is unlikely to be introduced into New Zealand for a considerable time, as its advantages over the round bottle are not sufficiently substantial to make its introduction really worth while at present.

By far the most popular type of bottle is the clear glass one. At present New Zealand makers are obliged to use amber-coloured glass, following the enforced example of Europe during the period when white glass was unprocurable for milk bottles because of enemy occupation of sources of supply, particularly in such countries as Norway. Undoubtedly colourless glass is popular for milk bottles because the customer can see what the milk looks like before buying the bottle. Colourless bottles have the added advantage

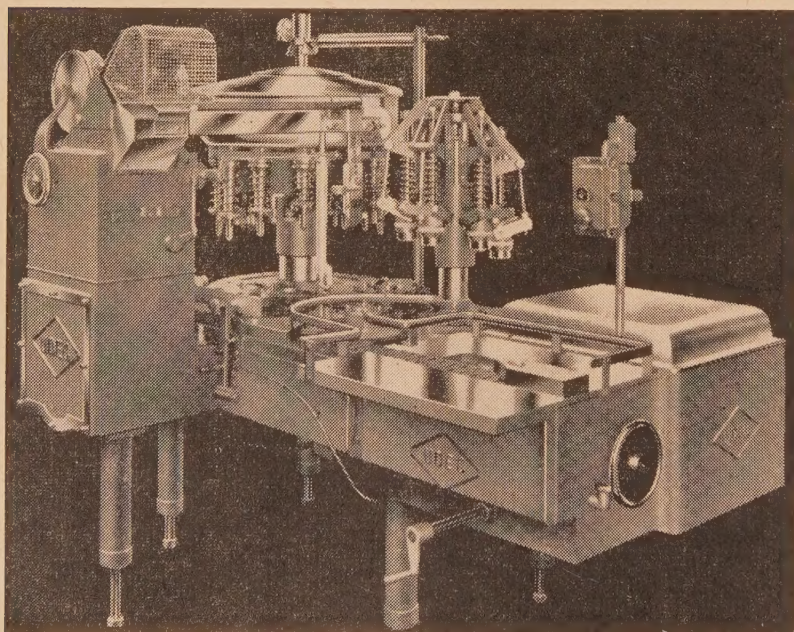


A popular British-made automatic bottle-washing machine working on the straight-through principle and capable of handling 12,000 bottles an hour.

FILLING AND CAPPING MACHINES



A gravity-type automatic bottle-filling and capping machine. The milk is delivered into the bottles from the circular bowl on the top left of the machine through the spring-loaded valves directly below the bowl. The bottles are capped on the right-hand part of the machine, the cardboard caps being fed from the tall metal cylinders.



A bottle-filling and aluminium capping machine. In this unit special metal caps are formed from strips of aluminium foil in the box-like part of the machine on the left. They are then fed to the tops of the filled bottles and sealed in place by the spring-loaded clamping devices on the right of the machine.

that they are more easily inspected after being washed than are coloured bottles.

Some scientific reasons exist for a wider usage of coloured glass in the milk trade, but customer acceptance of a package is important commercially, and customers all over the world have made their viewpoints clear when they insist on colourless bottles. Sometimes bottles which are not well made have a faint greenish or bluish tinge, and those colours are undesirable, as they detract from the rich appearance the milk should have in the bottle. However, one off-colour in the glass which is not unwelcome is one which gives a very faint amber tinge to the milk, enhancing its naturally-rich appearance.

Expense of Bottles

Bottles represent a heavy capital investment by the dairyman. The number in circulation might be thought of in relation to the number of gallons handled in one day, but in practice a dairyman who decides to provide all bottled milk must order at least four days' supply of bottles, and he is usually better advised to order five days', giving him a spare day's supply in stock. In ordinary practice one set of bottles is being filled at the dairy, one set is on the roundsman's vehicle being delivered, one set is at the customer's premises, and one set is in the course of transfer from the customers' premises on to the roundsman's vehicle. Unfortunately, customers are not always prompt in returning their empty bottles, which means that very often the number of bottles in circulation bears little relation to the formula of a minimum four days' supply. Surveys have shown that in certain districts of some towns a nine days' supply of bottles is necessary to maintain the efficient operation of the dairy.

Though less so in New Zealand than elsewhere, bottle losses caused by illegal use of bottles can prove quite serious. Even when the dairyman's name is printed on the bottle it is amazing into how many other dairymen's premises he finds his bottles disappearing. That is no great embarrassment where delivery areas are zoned, but it is a very serious difficulty in cities where zoning is not in effect and selling is competitive. To obviate losses through this system bottle exchanges are widely used. In many cases these are run co-operatively, and the practice is for each dairyman to put aside each day other men's bottles he comes across before they go into his washing machine; periodically an exchange is effected, so that he returns bottles which are not his own and receives from the other dairymen any of his bottles which have found their way to their premises.

Bottle Washing

The washing of milk bottles is an important process in modern milk-treating houses. When they are returned to the depot bottles may appear clean or they may be extremely dirty, usually depending on the fastidiousness of the customer. The inherent danger in the milk bottle when it comes back to the depot is that it may contain disease-bearing germs, and it is essential that any system of cleaning sterilises the bottle as well as washes it.

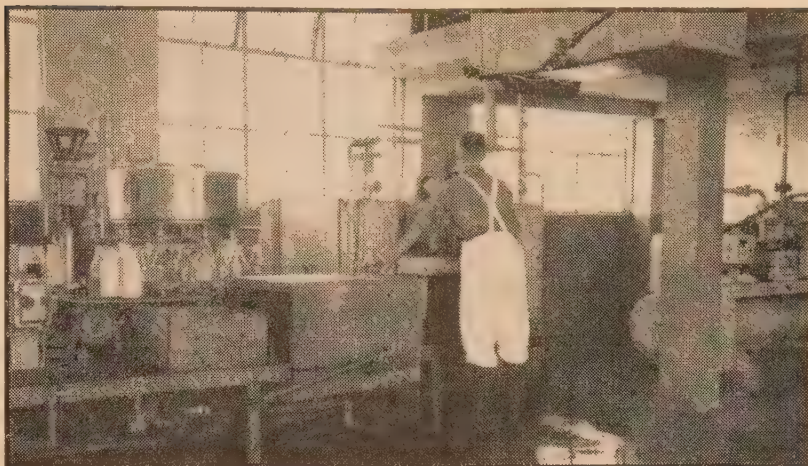
In the early days of milk-treating plants bottles were usually washed by soaking them in a hot soda solution, brushing them on rotary brushes, and rinsing them with clean cold water. That method can give good results, but it is not reliable and is unsuitable for large-scale commercial application. Bottle washing has evolved very considerably from that system, though the basic principles have not really altered. The general routine of hot soda soaking, brushing, and final rinsing is still followed, but the whole process has been elaborated considerably.

In modern machines the bottles are usually treated to a preliminary rinse with clean warm water, then are either soaked in or sprayed with a hot soda solution, usually at a temperature of 140 degrees F. or higher, after which they are rinsed with clean hot water and finally rinsed with clean cold water. Some machines brush the bottles, using ordinary circular brushes; others depend on the swirling effect of the forced spraying with hot soda solution. Both types give equally satisfactory results, and the same applies to machines which depend on soaking instead of spraying.

Bottle washers are quite impressive-looking units of the dairy plant machinery, and one capable of washing 10,000 bottles an hour might be as big as 25ft. long, 8ft. wide, and 6 or 7ft. high. Its operation is simple: "The bottles are put into individual holders, or baskets, as they are called, at one end of the machine and they emerge at the other end sterile and sparkling. In some types of machines, called "come-back" units, the bottles emerge at the same end as that into which they are loaded.

From the washing machines the sterile bottles are carried by mechanical conveyers in single file to the filling machines. These conveyers are an important part of the set-up of a modern milk-treating house, especially in the washing and filling sections, where they are indispensable for keeping the bottles sterile in their journey between the washing and filling machines. In the most modern plants the conveyers are covered with stainless steel hoods, on the inner side of which are mounted special lamps which radiate ultra-violet rays. These

WASHING AND FILLING MILK BOTTLES



[Robert Williamson photo.]

Bottle washing and filling in an efficient depot at Westport.

rays are directed down on to the mouths of the bottles and assist in keeping them sterile during their journey on the conveyers, as the rays have a bactericidal effect on surfaces exposed to them.

Bottle-filling Machines

Modern bottle-filling machines are quite complex but do not seem as impressive to the onlooker as the washing machines, which are of necessity much bigger. The machine fills the bottle in such a manner that human contact with the bottle or the milk is avoided. These machines are made in various sizes which can fill bottles at rates ranging from 1000 to 12,000 an hour. They are adjustable for filling any of the usual sizes of bottles used in today's dairies.

Most bottle fillers work on the bottle-as-measure principle, not delivering a fixed volume of milk but filling the bottles to their maximum capacity. Some manufacturers make a fixed-volume type of filler, but few of them are available today compared with the other type. Fixed-volume types of filler used to be quite popular in England, for example, but the trend has been toward the more orthodox type which fills any size of bottle to the top.

Bottle-filling machines can work on the gravity or the vacuum principle. In the gravity system the milk flows into the bottle and the air in the bottle escapes through a vent tube which rises above the level of the milk in the tank or bowl feeding the machine. The venting of the air is automatic and no mechanical assistance is required for this process. In the vacuum type of filler the air is sucked out by a vacuum pump and the space which it occupied is immediately filled with milk.

Usually the vacuum type is somewhat more expensive than the ordinary gravity type of machine, but the vacuum machine has the big advantage that it cannot fill bottles which are chipped or cracked. There is also very little loss caused by drips from the filling valves when the machine is working, as the vacuum tends to keep the drips sucked up into the valves.

Most modern bottle fillers operate on the rotary principle; that is, bottles follow one another around, each meeting its appropriate filling valve under the circular milk-holding bowl or tank, which is an integral part of the machine. After it is filled the bottle moves on to the rotary capping section, where it meets its appropriate capping head, after which it leaves the machine and places itself back on the conveyer for transfer further along the line to the re-crating table, where the filled and capped bottles are placed in crates for transfer to the cold store.

A few large machines are still made in which the bottles are filled in lateral lines of four to 20 at a time. The manufacturers have adapted this idea in such a way that the bottles do not actually leave the washing machine—through which they have already travelled in lateral lines—but move on to another section of the unit, which is equipped as a filling machine. The advantage of this method is that it obviates the need for a conveyer system between the washing and filling machines.

Some of the best bottle-filling machines made today are fabricated almost entirely from stainless steel, and this type of construction makes the dairyman's work much easier at washing-down time. Apart from its

MARKET MILK CONTAINERS



[Photo News Ltd. photo.]

Milk containers from other countries. The half-pint carton on the left is used by an English dairy, the pint carton beside it is used in France, and the quart size holds the product of a widely-known American firm. The centre bottle is a squat pint with a waxed-paper over-all cap, and the other three are the quart, pint, and half-pint sizes of the new square milk bottle now achieving considerable popularity in the U.S.A.

inherent long-wearing qualities, construction in stainless steel has the further advantage that periodic repainting of the machine is not necessary—an important factor, as painted surfaces on bottle fillers cannot be kept spick and span because of the action of the hot caustic solutions used for washing down the plant.

Capping the Bottles

The variety of bottle caps is almost as wide as the variety of containers. The most widely used is the cardboard disc, a comparatively-cheap type of cap and one of the earliest developed for the purpose. It has advantages, but does not protect the pouring lip



[Photo News Ltd. photo.]

The type of aluminium-capped milk bottle likely to appear in New Zealand in the near future.

of the bottle unless it is specially made to do so. Progressive dairymen are gradually deserting the cardboard disc as it is known in this country for more elaborate types of closures which give better protection to the top of the bottle and present a more attractive appearance to the customer.

In New Zealand the tendency is to change to what is called the aluminium cap, which completely covers the pouring lip of the bottle, can be handled quite readily by the roundsman with-

out fear of its pulling off the bottle, yet offers little difficulty to the housewife when she wants to open it, which is done by lifting the cover off with a thumbnail or stripping it off by the tab which is a part of certain makes of these caps. Aluminium caps can be bought pre-formed—that is, shaped and ready for fitting to the bottle—or the aluminium can be bought in long thin strips, from which the caps are made and applied to the bottle by an automatic filling and capping machine. The aluminium caps can be made and supplied in almost any colour the dairyman desires, and the lettering or wording he wishes to use or which may be required by local ordinance is usually embossed on them while they are being made on the cap-making section of the capping machine or they can be supplied pre-printed.

Some of these new aluminium caps should appear on New Zealand milk bottles during next year, and it will be interesting to see if the New Zealand housewife likes them as much as does her counterpart in many other parts of the world.

Another type of closure which has attained a wide and justified popularity is the crown cork type. This is like the crimped caps on beer bottles, but when used for milk the caps are usually made somewhat larger and are fitted with an insert of waxed cardboard or similar material. Once applied these caps are tamperproof, attractive, and hygienic, and they are used in many towns in America. In England they are widely used for sterilised milk and also by producers who wish to present an exceptionally-attractive package for promoting the sale of such special milks as "Certified," "Tuberculin-tested," or "Accredited."

Some manufacturers supply paper covers which have to be applied over the bottle top after the cardboard disc has been sealed in position. An elaboration of this style is a special-shaped wax over-all cover, which is sufficiently strong to enable the cardboard disc to be dispensed with; this type is quite attractive and thoroughly hygienic.

Single-service Containers

Single-service containers is the name usually given to waxed cardboard cartons—irrespective of shape—which are used for the retail sale of milk. Cartons have attained varying degrees of popularity but they have to compete with the relative economy of the glass container or bottle, which can be used many times. Waxed cardboard cartons are hygienic, light, and attractive. They appeal particularly to dairy shops and grocery stores where milk is sold retail over the counter, especially where charges are made on returnable glass bottles, as they relieve the shopkeeper from the need for collecting deposits on milk bottles taken away by customers.

A wide variety of shapes and sizes is available to the prospective user of milk cartons but they are not important as long as the design is sufficiently robust for the cartons to stand up to the usage they get in being filled and sealed in the dairy, transported to the store, and sold over the counter.

The filling of cartons presents little difficulty in modern dairies, though special equipment other than that used for filling bottles is necessary. In the larger plants the cardboard used for making the cartons is fed into special machines which fabricate the cartons and wax them with sterile wax under heat, after which they pass on to a special attachment to be filled with milk, and to a sealer to be sealed; in none of those processes is the milk or the carton touched by hand. The filled and sealed cartons are placed in special crates or trays and taken to a cold store, where they are held ready for dispatch. The whole process is hygienic and is in use in quite a number of dairies overseas. Smaller dairymen use pre-formed waxed cartons for the sale of graded milks, but they would be too expensive for the big dairyman compared with the cost of making and waxing cartons on the job.

On the basis of cost, any substantial change from glass bottles to cartons is hardly likely for many years. In New Zealand they have not been adopted to an appreciable extent in the milk trade, and present indications are that the use of glass bottles will continue for a long time. Even if change were desirable, on the score of economy, with world prices as they are today, cartons would appear to have an uphill task to prove themselves a sounder proposition than the glass bottle.

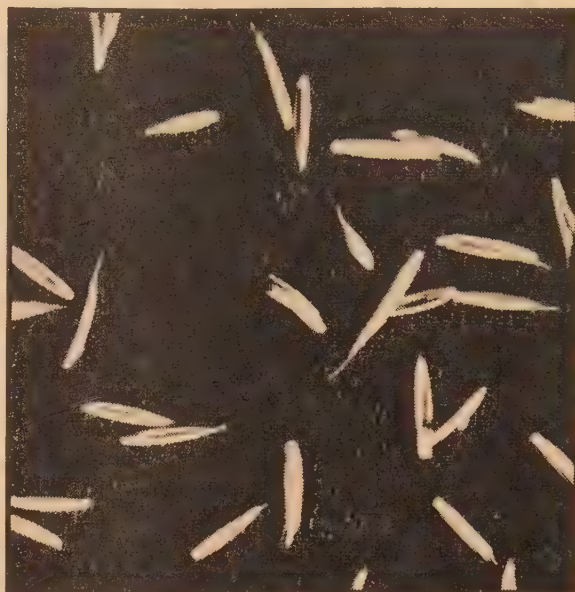
SEED PRODUCTION IN NEW ZEALAND

Chewings Fescue

By W. FAITHFUL, *Fields Instructor, Gore.*

THE production of chewings fescue seed, though of comparatively-minor importance to the majority of the farming community of New Zealand, is regarded very differently by the producers of the major portion of the crop in Otago and Southland. The history of the production of chewings fescue seed goes back to 1880, when a farmer in the Rimu district of Southland sowed down a two-acre paddock in grass. He was probably unaware that this common farming operation was destined to open up a new avenue of export for primary produce, which was to be of considerable financial benefit to a large number of farmers in the province, but the grass seed he used was later to be known as chewings fescue.

THE origin of the seed that was sown is obscure. A pamphlet issued by the New Zealand Grain, Seed, and Produce Merchants' Federation, "Grasslands of New Zealand," states: "The imported seed which originally produced chewings fescue was some type of fescue grown in Europe, and it is claimed by some that the seed was dropped from grasses used to pack goods coming to New Zealand." A more likely explanation is that the seed was supplied in a lawn grass mixture obtained from Hurst and Sons, London, and that this mixture was sown by the Rimu farmer, as he required a grass that would make a dense sward quickly and would not be poached up by cattle. The mixture is said to have been recommended to him by an Invercargill seed merchant. Whatever its origin, most reports about the development of the production of the seed during the years following the original sowing more or less substantiate one another.



Chewings fescue seed.

Origin of Name

The small paddock was harvested for seed, and later some, if not all, of this seed was used for sowing in some of the paddocks on "Glenelg," a property in the Mossburn district of Southland. In 1887 that property was bought by Mr. George Chewings, and the first considerable quantity of seed, about 80 sacks, was harvested in 1890. The following year about 250 sacks were harvested and sent in for cleaning. By this time the production of the seed had attracted neighbouring farmers, and in the next season more than 600 sacks were sent to Invercargill to be dressed.

During this early period it appears that all the seed produced had been bought by one seed merchant, and with the increase in the number of farms producing, and the larger quantities of seed to be dealt with, some difficulty was being experienced in disposing of it. However, about this time Mr. Chewings went to the North Island on holiday, and during his visit advised various runholders to try some of his fescue seed, as he thought it would probably be suitable for the pumice lands of Auckland. The result was that inquiries were received in Invercargill for samples of and quotes for "Chewings' fescue," and the seed has been called chewings fescue since.

Rise of Export Trade

As a result of the difficulty in placing the increased quantity of seed being produced the 600 sacks were taken over by Tothill, Watson, and Co., seedsmen, of Invercargill, who were agents for Sutton and Sons, Reading. Through the efforts of these two firms interest was aroused in chewings fescue in Britain and the foundation of an export trade was laid. However, the fame of this fescue has not been confined to Britain.

In 56 years production has increased from a mere 80 sacks to a maximum of more than 1100 tons in 1945. The following table shows the volume and value of seed exported in recent years (exports represent practically all the seed produced):—



Renovated fescue.

PRODUCTION OF CHEWINGS FESCUE SEED



The first commercial crop of chewings fescue was grown in the paddock in the foreground at "Glenelg," Mossburn.

Year	Cwt.	Value (£N.Z.)
1935	8,857	83,253
1936	21,446	96,480
1937	13,394	78,518
1938	11,594	103,792
1939	13,110	122,331
1940	17,485	129,694
1941	18,872	123,601
1942	14,868	101,509
1943	17,752	142,166
1944	10,607	125,918
1945	23,362	325,829
1946	18,503	253,853

Shipments to many parts of the world have resulted in regular orders, from the U.S.A., the United Kingdom, Canada, Australia, France, Holland, Denmark, and South Africa. For many years Germany was also a steady importer, but after 1927 the quantity of seed sent decreased remarkably, and then followed a steady decline until 1933, when export to Germany ceased.

During the past 10 years the acreage of chewings fescue harvested for seed has varied between 8000 and 15,000 acres, with an annual average for the period of 12,600 acres. This average acreage has been divided among various land districts as follows:—

Southland	11,700
Otago	660
Canterbury	220
Other districts	20

Yields of seed in the past decade have varied from 120lb. to 180lb. an acre, with a Dominion average for the whole period of 161lb.

Place in Farm Practice

In earlier times large areas of land in New Zealand were sown in oats each year. That was the most profitable crop that could be grown at that time, but it necessitated repeated ploughing and cultivating with an attendant loss in fertility. The introduction of fescue seed production was decidedly advantageous, even though the seed was sold for about 2½d. a lb. at the mill. This crop could be harvested

for a number of years without the necessity for resowing, so fescue was sown on large areas which had previously been used for growing oats. Later fat lamb production became attractive, and, as much of the land which had been producing fescue seed was able to carry better-class pastures with the aid of lime and artificial fertiliser, a further change was brought about. Instead of the farms being mainly arable and fescue seed producing, more and more attention was paid to sheep farming and the fattening of lambs. The result of these changes was that many farms were more closely subdivided and the acreage of fescue to a farm was reduced considerably.

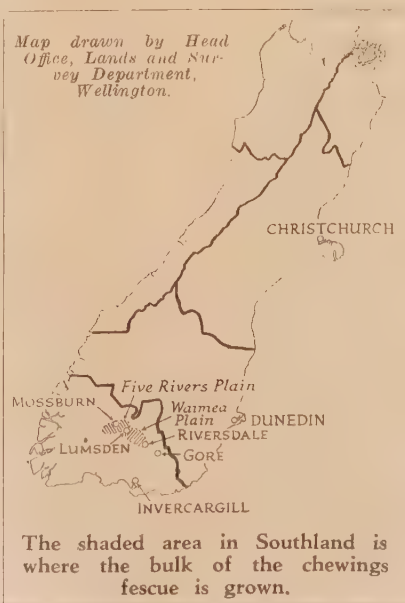
At present the extensive blocks of fescue are mainly on land which it is considered cannot be economically raised to a sufficiently-high standard for lamb fattening. However, it must not be concluded that all the fescue is produced on low-fertility land; quite a large proportion is being grown on

paddocks of comparatively high fertility, but usually these paddocks are only a very limited part of the farm. The seed is regarded as a cash crop, or, as one farmer has expressed it: "Seeding fescue on this type of land is bad farming according to present-day farming practice, but the return from a good crop is a good 'lift'."

Climate and Soil

For seed production fescue requires moisture in the spring and sufficient heat and moisture during the summer to ensure well-developed seed of a good colour; good seed is steel blue and weighs 27 or 28lb. a bushel, and seed of average quality weighs 23 to 24lb. a bushel. Hot, dry conditions are necessary during the short harvesting period. Soil type is also important in seed production: Very light land inhibits early establishment and vigour of the fescue and permits the ingress of undesirable weeds such as sweet vernal, hair grass, catsear, fog, and browntop; on too heavy land the fescue sward thickens up quickly and seed production suffers in consequence. The balance between soil type and climate appears to be nicely adjusted in the central Southland districts where the bulk of the seed is grown.

The main seed-producing area is on the silt loam soils in the valleys of the Waiau, Aparima, Oreti, Waimea, and Mataura Rivers and their old courses and extensive flood plains. Almost surrounding and penetrating into the fescue country are ranges of hills and mountains, which have an important influence on the climate. Winter conditions are usually cold and bleak, with fairly-heavy snowfalls, and the spring, summer, and autumn seasons approximate those mentioned as being necessary for the production of good seed. Attempts have been made to produce fescue seed in other parts of New Zealand, but they have not been very successful, unsuitable climate and soil conditions probably contributing to failure, not only in New Zealand but also overseas.



Preparation of Land

Clean land is a fundamental necessity in any paddock intended for fescue seed production. The growing of cleaning crops and fallowing are advocated, though they are not always carried out. A true fallow permits the thorough working out of such weeds as browntop and fog, both of which tend to thicken up in the sward and suppress the fescue. A run-out fescue paddock is usually ploughed in May with a swamp plough, using undercut coulters; undercutting permits of the furrow being turned over quite flat. The land should then be fallowed, followed by sufficient working during the summer to bring couch to the surface. Ridged turnips may follow, as a cleaning crop, and grain the next season. If the paddock is clean, the fescue seed may then be sown. That should not be attempted if the paddock is still dirty, but a further cleaning crop should be sown or the land fallowed again. Fescue may be sown with or without a cover crop, but usually lamb-fattening feed such as rape or rape and turnips is used. The seed is usually sown in November. The fescue seed may be drilled in or broadcast; seeding rates are about 14lb. of machine-dressed seed an acre for drilling and 18 to 20lb. an acre for sowing broadcast. If drilled in, the seed is sown through every coulter; it is advisable to use old coulters to avoid burying the seed too deeply.

Management

Usually fescue is not regarded as a good pasture grass, but if it is kept at a short stage of growth, sheep graze it quite readily. On quite a number of farms the fescue paddocks are grazed and seeded in alternate seasons. Usually that method is used on the rather higher-fertility land, and it is found that the grazing animals tend to control weed growth and the aggressiveness of other grasses, both

HARVESTING CHEWINGS FESCUE SEED



The type of sheaf trolley, used for carting in fescue. The built-up sides protect the fescue from wind, reducing losses caused by shedding.

of which are most undesirable in a fescue seed-producing area. By this method the fescue stand is maintained for a longer period before any renovation is necessary.

On the lower-fertility areas, where the fescue blocks are usually more extensive, grazing may be undertaken or not according to the vigour of grass or weed growth, but it is found advisable to run a few sheep in a fescue block to control the seeding of catsear (*Hypochaeris radicata*). The sheep keep the heads of this objectionable weed nipped off and prevent its seeding. One sheep to three or four acres is usually sufficient, and they are taken out about a week before the flower goes off the fescue to avoid damage to the crop. Ryegrass in a fescue stand is mainly controlled in the same manner. The chief objection to both of these plants is the difficulty of separating their seeds from those of chewings fescue because of their similarity in size.

Topdressing

Results from topdressing are sufficiently controversial to prevent a definite recommendation being made. Some very profitable returns have

been produced by an application of sulphate of ammonia or ammoniated superphosphate, and there have also been very disappointing results; much depends on the weather after the application, as there must be sufficient moisture to ensure benefit from the fertiliser.

It would seem that best results are obtained if the application is made in early spring.

Harvesting

The harvesting of fescue requires skill, judgment, and experience, as the seed is very easily shaken. One of the disadvantages of the fescue country is that strong westerly gales are experienced during harvest time, making the saving of the crop somewhat hazardous.

In an average season cutting is undertaken in December, and the work must begin as soon as there is any evidence of the developed seed falling when touched. To secure a good sample it is necessary to permit the seed to be as ripe as possible before cutting it; the need for skill and judgment is obvious, and speed is essential.



Fescue in stook on Five Rivers Plain.

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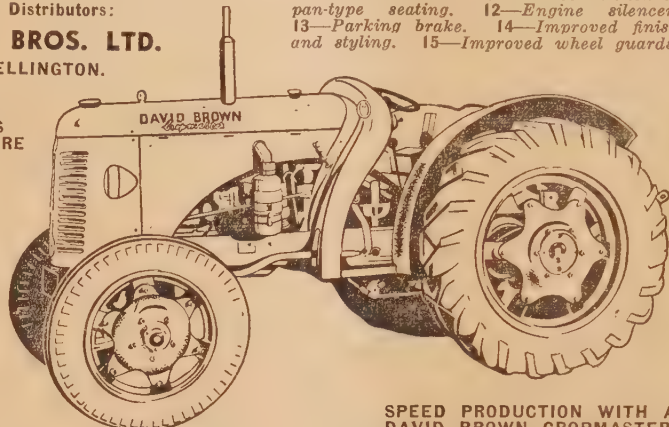
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Binder Cutting and Heading

Fescue is usually cut with the binder; direct heading, though it has been done, is not common. For direct heading, the crop has to be left until almost dead ripe, which is inadvisable, as a strong wind at that stage is likely to shake all the seed. If heading is undertaken too early, the seed will heat in the sacks.

The crop is stooked immediately after the binders have passed, remains in stook for about three weeks, and if possible is threshed out of the stook. As the seed sheds very easily at this time, special care is necessary when forking, and special trolleys are made to cart the sheaves to the mill; these trolleys considerably reduce the loss of seed which would otherwise be experienced.

Though fescue is threshed very easily, care is necessary in the setting and speed of the mill, particularly a tin mill with peg drum, which if not properly set chops up the straw. This very short straw is difficult to remove when the seed is dressed. The setting of the mill depends a great deal on the condition of the crop, but usually the concave should not be set too close to the drum, and in tin mills only sufficient concaves should be left in to ensure clean threshing. Speed should be as low as is commensurate with good threshing.

Renovation

The "twitchy" habit of fescue causes the area to become "turf bound" and it will not then produce seed, renovation by skim ploughing being necessary. Good judgment is necessary to decide when a fescue stand should be renovated, and it should always be done before there is much ingress of Yorkshire fog and browntop, as the skimming will increase rather than

HARVESTING CHEWINGS FESCUE SEED



Threshing fescue on Five Rivers Plain.

decrease these weeds. This ploughing should not be undertaken until the frost risk has passed, as frost breaks up the furrow and kills the fescue.

If the job has been done skilfully, the fescue comes away between the plough furrows in the following spring. No seed is harvested from a renovated area in the harvest period following renovation.

Weeds and Seed Cleaning

The need for care during threshing is manifest at the dressing plants; if the line has been badly threshed, the small pieces of chopped-up straw are very difficult to remove at dressing and the purity of the line is reduced by excessive inert matter.

The most objectionable weeds in fescue seed are catsear, sweet vernal

(*Anthoxanthum odoratum*), and hairgrass (*Festuca bromoides*). Catsear is the worst of the three, as the seed is the same size and weight as that of fescue and cannot be removed by either riddles or cylinders on the seed-dressing machine. Sweet vernal is removed by placing felts or blankets on one of the riddles, the bent awns of this seed causing it to adhere to the felt. Hairgrass is removed by the cylinders if the awn has not been damaged; if that has happened it is difficult to remove.

For export merchants endeavour to supply seed with a minimum purity of 98 per cent. and germination of 90 per cent.

Germination

Practically all the seed produced is exported, but the overseas market has been affected for many years by the fact that the germination of fescue seed is subject to deterioration in transit. During the war the non-availability of cool stowage in cargo ships and the long period during which seed was sometimes in transit greatly aggravated the deterioration, with the result that on arrival considerable quantities of seed failed to reach the minimum germination standard of the importing country.

Before the war, when both prompt shipping and cool stowage were available, the loss caused by lowered germination was not particularly serious, but investigations were undertaken in an endeavour to account for the deterioration. It was thought that probably the time or stage of ripeness when the crop was cut, or the usual practice of threshing direct from the stook without giving the seed time to "sweat" in a stack, might be responsible for this loss in vitality.



Renovated fescue showing ingress of sweet vernal, catsear, and browntop.

PRODUCTION OF CHEWINGS FESCUE SEED



A winter scene on Five Rivers Plain.

During 1932 and 1933 experiments were conducted by the Department of Agriculture to investigate this problem. One of those trials covered 12 commercial lines, six of which were threshed out of the stack and six stook threshed. The results showed no superiority of the stack-threshed over the stook-threshed seed when tested for germination in New Zealand.

A further stage of this experiment was the artificial drying of part of each lot of seed before shipment. Samples of the two lots were sent to America and on arrival the dried seed gave definitely superior results under germination test.

Another experiment consisted of three manurial treatments incorporating superphosphate, sulphate of ammonia, and 30 per cent. potash salts,

as well as the cutting of the crop at different stages of maturity. All lots were threshed out of stook and showed no significant differences in germination of the seed when tested in New Zealand.

Seed which had been artificially dried and cool stored was shipped to the United Kingdom, using the following methods:—

1. Dried to 5 per cent. moisture and shipped in lined, moisture-proof sacks.
2. Dried to 9 per cent. moisture and shipped in lined, moisture-proof sacks.
3. Undried and shipped in cool storage.
4. Undried and shipped under ordinary hold conditions.

Samples from each lot were placed under test at the official seed-testing

station, Cambridge, and the result showed little or no loss in vitality in the seed which had been dried and shipped in moisture-proof sacks. Undried seed shipped in cool storage and under ordinary hold conditions showed a loss of from 1 to 13 per cent., the greatest loss being from that which was cut at the barely-ripe stage.

The loss in germination of those test lines was very small, considering that commercial shipments, in ordinary hold storage, had been reported on arrival overseas to have a germination of only 30 per cent.—some even lower. However, the trial did give comparative figures and indicated that both cool storage and artificial drying were advantageous, but allocation of refrigerator space for seed was a difficulty. The artificial drying of fescue is becoming increasingly popular and shipments of seed treated in this way are now being made regularly. According to report, the germination of lines which have been dried and packed in specially-lined sacks is quite satisfactory on arrival.

Uses of Fescue

Chewings fescue is capable of forming a close, fine, and even turf that will stand hard treatment. It is therefore an excellent grass for recreation areas, bowling greens, golf courses, and race tracks, and has proved admirable for aerodromes, particularly during the Second World War. The area which the quantity of seed exported can sow every year is not as large as would appear at first, because the sowing rate for turfing is $\frac{1}{2}$ oz. to the square yard, or 150lb. an acre.

Acknowledgments

Thanks are expressed to the Customs Department for figures of exports, to members of the seed trade in Southland, and to the fescue growers, who have furnished information enabling this article to be prepared.



[Photo News Ltd. photo.]

Chewings fescue forms a close, fine, even turf excellent for bowling greens, golf courses, and race tracks.

HOME GARDEN MAY BE TIDY AND ATTRACTIVE EVEN IN THE WINTER

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

THE home garden is rarely an attractive place in May except for the true garden lover. In most gardens there is little planting or sowing to be done and work consists mainly of harvesting and clearing off residues of recently-harvested crops and trenching, digging, or forking over cleared surfaces to expose them to frost or to sow cover crops on them.

SOWING and planting should be done with discretion. Little growth can be expected in most gardens for the next two months and the home gardener must decide whether anything is to be gained by sowing or planting any but the hardiest subjects now; whether to expose seed or young plants to the hazards of the weather for the next two months if they are likely to make little growth and yet be liable to the attack of insect pests and diseases. Cabbage, endive, and, to a less general extent, lettuce and cauliflower can be set out; peas, broad beans, and spinach can be sown, but unless the garden is in a specially-favourable situation and climatic conditions are very good, it is best now to defer sowing seeds such as carrots and onions and even turnips and radish until July or later.

The digging of potato and kumara crops should be completed without delay; potatoes and other root crops in store should be sorted over to remove rots. Vacant ground can be limed; earthing up of celery and leeks should be completed and if necessary the compost heap should be turned



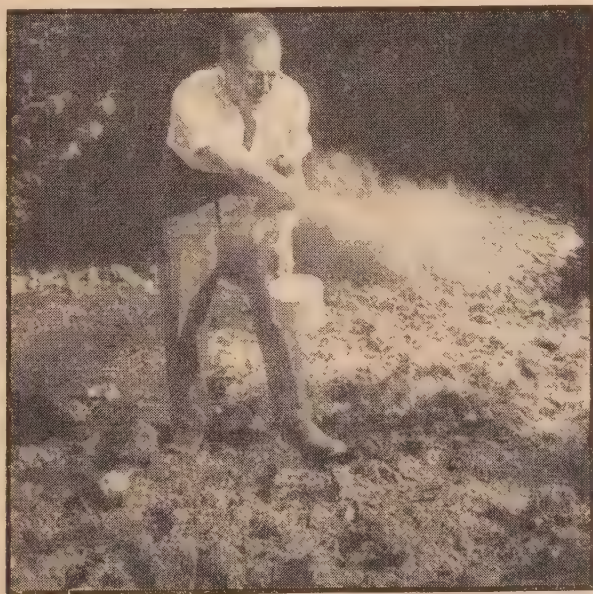
[Sparrow Industrial Pictures Ltd. photo.]

Potatoes are best dug now. The danger of infestation with the potato tuber moth may be guarded against by covering and bagging potatoes as soon as they are dug.

or a new one built. Rhubarb should be weeded and seed stalks removed, and asparagus should be cut down and weeded as soon as the top growth commences to turn yellow. The hoe, particularly a type such as the swan-necked, solid draw, or "chop" hoe, should be kept going; a hoe of a Canterbury type will be found specially useful. The Canterbury hoe has three long, flat, sharpened prongs which are used to chop into the soil and loosen it. Deeper penetration and better aeration can be obtained with less effort than with ordinary hoes.

Tidying the Garden

If the garden is kept tidy it can be made quite an attractive place in winter even to those who are not gardeners. The cleaning out of untidy corners where unwanted grass and weeds are growing and the removal of such trash as old boxes, pieces of wood, old useless posts, stakes, bricks, and stones not only improve the appearance of a garden but have an important bearing on pest and disease control. Untidy corners provide ideal breeding grounds for such garden pests as earwigs, slugs, snails, slaters, cutworms, millepedes, and wireworms. Marginal as well as crop weeds should be destroyed, as they often serve as a means by which pests such as thrips, mites, and aphides, which are often considered more serious, are carried over from season to season. They also serve as host plants for virus and fungus diseases from which insects infect the next season's crops. All weeds, long matted grass, and untidy corners should therefore be cleared away; soft rubbish can be composted; unwanted woody material should be burnt, as it is liable to be a source of infection from such diseases as coral spot, which is recognisable by the bright coral or orange spots which are the fructifications (or flowering stage) of the fungus and silver leaf disease, recognisable by a silvering of the leaves and later by the development of flat, leathery, circular or semi-circular purplish discs which usually grow out at right angles to the affected wood or tree.



[Sparrow Industrial Pictures Ltd. photo.]

Vacant ground or areas from which crops have been recently harvested may be trenched, dug, or forked over, after which a dressing of lime will be beneficial, or a cover crop may be sown.

THE HOME GARDEN IN MAY . . .

Both coral spot and silver leaf diseases are wound parasites which attack a wide range of ornamental, timber, and fruit trees, though coral spot is a saprophyte and more commonly attacks dead wood. Though the refuse of some diseased crops may safely be put on the compost heap, if there is any doubt about the longevity or resistance of the spores of the disease to destructive agencies, the fire is the best place for it; the fire too is the best place for most garden refuse that is infested with insect pests. The ash of such material is a valuable source of potash and should be gathered and put under cover, before rain falls on it. It is a useful fertiliser for such crops as onions, tomatoes, and certain tap-rooted vegetables. The potash content of garden trash varies considerably according to age and kind; young wood, twigs, and bracken contain more potash than old wood.

Many home gardeners think that by burning material that could be composted they are gaining something new. This is not so. Burning is a wasteful process and what actually happens is that the useful organic or non-mineral matter is lost into the air in the form of a gas and only the mineral substance is left behind. Consequently lime, potash, and a certain amount of phosphates are left behind, though the valuable nitrogen is given off and lost. Ash that has been collected and stored as soon as the fire cooled may contain from 5 to 12 per cent. potassium carbonate, but as the organic material is lost in burning, it is very much more desirable to have a clean garden and to compost all relatively-soft material, burning only unwanted wood or very woody material.

Asparagus

Fern growth of asparagus should be cut down if it has not already been done, as if it is deferred too long, the seed ripens and falls and the young plants which come up the following season are often unnoticed and become established to the detriment of the bed. Fern growth can be cut with garden shears or with a sharp knife and the bed should afterward be weeded and dressed with compost or soil mixed with well-rotted farmyard manure.

Broad Beans

A sowing of broad beans for spring or early summer can be made now as advised in last month's "Journal." Unlike beans grown for summer and autumn, broad beans are quite hardy and do specially well in heavy soils that are well drained. Though broad beans are not particular about soil, it is not advisable to sow them in a light soil which tends to dry out, as

setting of the flowers is likely to be affected. Beans are usually sown in double rows 10in. apart, as support can then be more economically given. Seed should be sown diagonally 4 to 6in. apart and 2in. deep in the bottom of a trench 3in. deep. Though not advised except where limitation of space precludes the adoption of more orthodox methods, good results are sometimes obtained by planting greened and sprouted potatoes between the rows of young broad bean plants. This cannot be recommended as a general practice, as results are too uncertain, but in a good rich soil both vegetables sometimes yield well. Little earthing up can be done to the potatoes, but the beans afford some protection from frost. The potatoes are dug after the beans, which are early maturing, are finished.

Cabbage

A home garden planted with foresight in midsummer will be well supplied with cabbage. Though early-maturing savoy cabbage will be finished, there will be intermediate and late-maturing varieties to provide continuity of supply. Varieties such as Late Drumhead and Omega which mature successionally should provide supplies until August or early September, by which time in most districts spring cabbage will be available. Though the caterpillars of the white butterfly and diamond-backed moth are not likely to be troublesome from now on, where the grey aphid is present it will continue to distort and foul the foliage and growing points of members of the cabbage family. It is easily controlled by regular spraying with nicotine sulphate 1:600 (1 fluid ounce of nicotine sulphate to 4 gallons of water). Best results are likely to be obtained on a still and preferably warm day.

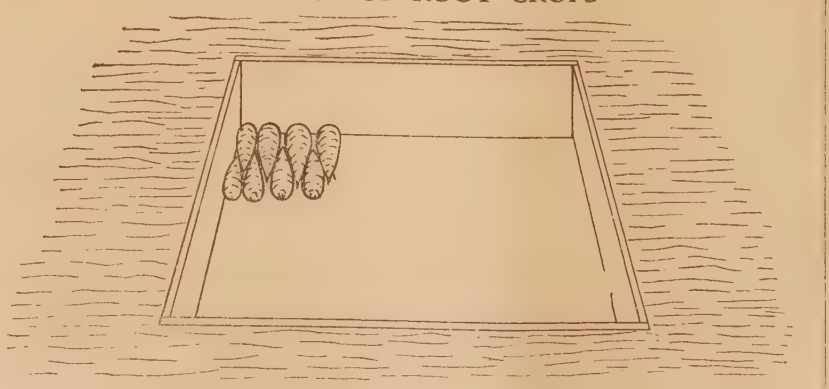
Spring cabbage can still be set out as advised in last month's "Journal." Sturdy plants should be chosen, as thin, weakly plants are slow in establishment. A well-drained soil rich in organic material is essential if early cabbage of good quality is desired. Plants for early cutting may be set out in diagonal pattern 12in. apart in rows 18in. apart. Cutting usually commences when the plants are quite young, and if desired every second plant can be cut and the remainder of the bed left to reach full development.

Cauliflower and Broccoli

Except in districts where the winter is very mild, the season for cauliflower is now at an end. Unlike broccoli, which is a specially hardy kind of cauliflower for growing in districts subject to severe winters, the cauliflower is easily damaged and checked by boisterous winter weather, and as the curd of most varieties is exposed, it is easily spoiled by more than a few degrees of frost. Both broccoli and cauliflower require a rich, fertile, well-drained soil; side dressings of nitrogenous fertilisers such as sulphate of ammonia or nitrate of soda should not be necessary at this time of the year if the ground was properly enriched before planting. If excessive nitrogenous fertiliser is given now, it is likely to produce soft vegetative growth which, particularly with late-maturing varieties, is liable to damage from winter weather. Plants should be kept cultivated and the soil weed free during the period of growth.

The hardier types of cauliflower such as All Seasons, Walcheren, or Early London may be set out now in sunny, sheltered situations or in districts where winter conditions are not too severe. The soil should be rich in well-rotted organic matter such as compost or farmyard manure, and if drainage is poor, a raised bed should be made. Plants can be set out 18in. apart in rows 24in. apart.

STORAGE OF ROOT CROPS



Roots for storage may be heaped in a box sunk in well-drained soil outdoors and covered with straw and if necessary soil on top of the straw.

Celery and Leeks

Final earthing up of celery and leeks should be completed during the month. Leeks are not always earthed up, but where long, blanched stems are desired earthing up is an advantage. Blanching usually stops the growth of celery, but only the older sorts such as Solid White are earthed up; newer varieties such as Golden Self-blanching are easily blanched with paper or boards as advised in last month's "Journal."

Harvesting

Pumpkins, marrows, and squashes: The harvesting of pumpkins, marrows, and squashes should be completed without delay. Even comparatively-light frosts which do not appear to affect the fruits may cause minute injuries to the outer skin and so provide a congenial environment for the development of disease-producing spores.

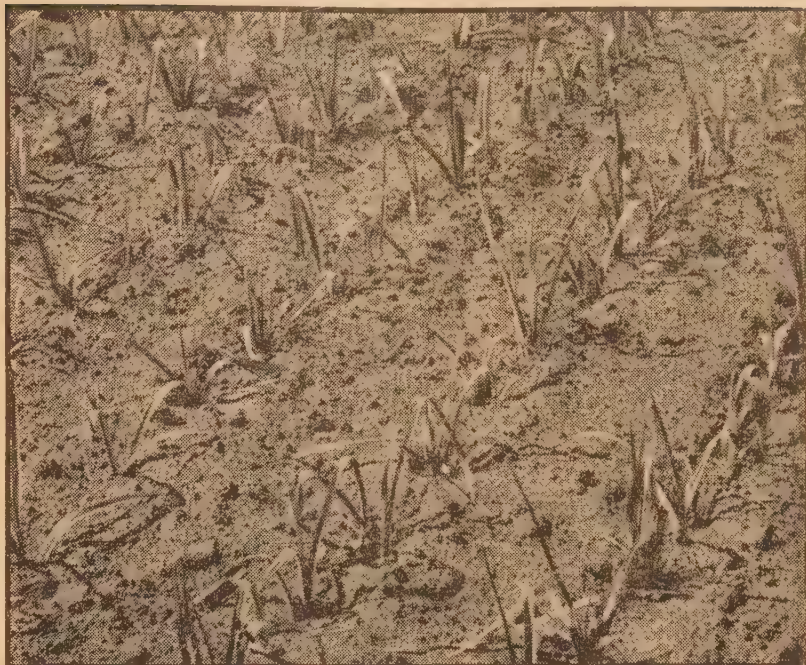
Kumaras and potatoes: Kumaras should be lifted without delay; potatoes, too, are best dug, unless the climate is particularly favourable and soil drainage and cultural conditions are very good. The danger of infestation with the potato tuber moth should be guarded against by covering and bagging the potatoes as soon as they are dug. The tuber moth is a night flyer and lays its eggs singly on the under-sides of potato leaves and in the eyes of exposed potatoes. Caterpillars which hatch from the eggs laid on the leaves gradually work their way down the stems; those from eggs on the potatoes penetrate the tuber and leave dirty tunnels in which fungus often develops later.

Root crops: In most districts root crops can be left in the ground, though beetroot, carrots, and occasionally parsnips may suffer damage if the winter is severe or drainage poor. All tap-rooted crops can be quite simply stored in sand or clean coal ash in a box sunk in the ground or in a cool shed or cellar.

Lettuce

At this late period of the season growth is slow in most districts and plants should be kept weeded and soil aeration and drainage improved by inter-row cultivation. If the rows are sufficiently widely separated and the roots are not likely to be damaged, cultivation should be relatively deep, as soil temperature will be improved and growth will be more vigorous where the soil is deeply aerated. If drainage is poor, lettuce plants should be set out on a raised bed and, except in the warmer parts of the country, a sheltered site with a northerly aspect is desirable. Like most salad crops, lettuce should be grown quickly if good-quality produce is desired, and at this time of year, when in most districts conditions are anything but good for growth, a light, sandy loam rich

THE HOME GARDEN IN MAY



If leeks with long, blanched stems are desired, earthing up is an advantage, and final drawing up of the soil round the stems should be completed this month.

in well-rotted organic matter such as farmyard manure or compost is desirable for growing or setting out plants.

Peas

Garden peas are fairly hardy, but in districts where winter conditions are severe they should be sown sufficiently early to enable the young plants to become established, but not so early that they make soft growth. Severe or unexpected frost will occasionally damage the haulms or affect the setting of flowers; usually the first difficulty with autumn-sown peas is to get the seed to germinate and the young plants established without falling victim to one or other of the many weakly parasitic organisms which are present in most unsterilised soils. Seed should be dressed before sowing with a suitable seed protectant such as copper carbonate or red or yellow copper oxide in finely-powdered form. The peas should be shaken vigorously for several minutes in a tin containing a pinch or just enough of the chemical to coat the seed. Afterward the tin should be tapped sharply so that excess powder falls to the bottom. Treated seed should not be sown on dry soil. Fungicides used to protect seed from fungi and other organisms commonly present in soil and capable of causing seed or young seedlings to rot before they emerge from the ground are generally called seed protectants, as distinguished from seed

disinfectants, which kill disease organisms on the surface of the seeds, and from seed disinfectants, which kill organisms inside the tissues. Good proprietary seed dressings are obtainable from most good seedsmen or retailers of horticultural sundries. They should be used according to the manufacturers' instructions.

Before sowing it is advisable to pick out discoloured seeds, as they may be infected with bacterial spot or collar rot fungus; seedling plants with yellowish foliage and black on the stems should be removed, as they may be infected with collar rot, and if so will infect other plants. During wet or continuous moist weather downy mildew, which is seen as a greyish growth on the under-sides of the leaves, sometimes develops, but it usually clears up in dry weather. Spraying with Bordeaux will check it.

Tomatoes

Tomato plants and their supporting stakes or wires should now be removed, if that has not already been done. Odd pieces of string used for tying and decayed or otherwise badly-damaged stakes are best burnt, as they often bear the eggs of insect pests or spores of disease. Plants infested with serious pests or long-lived diseases should be stacked or hung to dry and then burnt, but clean plants can usually be put on the compost heap to rot down. The ground cleared of the tomato crop should be deeply

SAVING TOMATO SEED



[Green and Hahn Ltd. photo.]

In the method of saving tomato seed described the fruit is cut and the pulpy content squeezed out for processing. On the left is $\frac{1}{2}$ lb. of seed ready for sowing. This should be sufficient to produce plants for about 4 acres. Counts of different varieties show that there are 7000 to 13,000 seeds in an ounce.

dug and then either left rough to expose it to the weather or sown with a cover crop.

Tomato Seed Saving

Many home gardeners like to save their own seed. Tomato seeds can be saved quite simply, and as tomatoes are almost completely self-pollinating, a specially-suitable stock can thus be retained over a number of years. Fully-ripened fruit is best; decayed or half-fermented fruit should not be used, as it is liable to sprout or go mouldy; clean, well-shaped fruit from healthy plants of a good type should be chosen. Seed can best be obtained by cutting fruit in half and then squeezing out the pulpy content. The old method was to ferment the juice in water; it had the important drawback that the period of fermentation was variable and considerable judgment was required to decide the correct stage to wash the seed; if left too long the seed commenced to germinate in the pulp and its viability was ruined. Staining and minor injury to the seed was common. The correct stage to wash the seed could be determined only by watching the ferment closely and stirring it from time to time to see when it "broke"—that is, when the tomato juice, which is like water, separated from the mucilage. With this method, even more than with the acid methods, cleanliness of hands,

utensils, and fruit was essential. Fermentation usually took from two to six days, depending largely on temperature; good results were usually obtained at 65 to 75 degrees F. More modern methods involve the use of washing soda or hydrochloric acid or dilute sulphuric acid. The object of fermentation or treatment with acid is of course to separate the seed from its colloidal seed sac. With the fermentation method the seed finally drops to the bottom of the water, and only undeveloped seeds or those not properly processed remain floating. Seed should not be left too long, as it may become darkened or discoloured and lose germination. The acid method is preferable. With commercial hydrochloric acid it is carried out as follows: 50 c.c. (or $1\frac{1}{2}$ fluid ounces) of commercial hydrochloric acid is added for every 2 lb. of pulp. The mixture is stirred and is ready for washing half an hour after mixing. The temperature should be about 60 degrees F. The seed can be washed by hosing it in a fine-mesh sieve or in changes of clean water. Diluted (30 per cent.) sulphuric acid may be substituted for the hydrochloric (concentrated sulphuric would damage seed by charring and impairing germination). Seed can also be treated with ordinary washing soda. A 10 per cent. solution is added to an equal bulk of tomato pulp and left for 24 hours. The seed is then

easily cleaned with water. Glazed or earthenware containers should be used for all the above chemicals.

If diseases such as bacterial spot, bacterial canker, and *altaria* collar rot and blight are present, seed should be disinfected with bichloride of mercury (mercuric chloride, corrosive sublimate) at the rate of 1 in 3000. The seed should be suspended in a fine net in the solution for five minutes, preferably at a temperature of 60 to 70 degrees F., and then washed thoroughly in many changes of water. The solution, for which a wooden, glass, or chinaware vessel should be used (it will quickly attack metal), can be made by dissolving 1 tablet ($7\frac{1}{2}$ grains) of bichloride of mercury in 3 pints of warm water. Alternatively seed can be treated for 25 minutes in water heated to a temperature of exactly 122 degrees F.; this method requires considerable care and more accuracy than can usually be obtained by the average home gardener. Hot water treatment sometimes impairs germination, especially if the seeds are old or weak; it is often advisable to treat a small sample and make a germination test first. Where soil-borne diseases are troublesome the seed should be dressed with copper oxide (cuprous oxide). A pinch of the chemical should be shaken in a tin with a small amount of seed, and powder beyond what is required to coat the seeds lightly should be removed.

Rapid drying is an important factor in seed saving, and after the seed is washed it should be spread out thinly to dry on fine gauze wire or cloth where it will be exposed to a gentle draught. It is important that the seed when stored should be perfectly dry or it may germinate prematurely; it should be raked from time to time to prevent it sticking in lumps. According to actual counts the number of tomato seeds per ounce varies with different varieties from 7000 to 13,000; the weight of tomatoes required to produce 1 oz. of seed is correspondingly variable and is usually reckoned at from about 12 to 25 lb. Tomato seeds are very retentive of life, but though they may be viable for seven or eight years, it is advisable to use them without undue delay, as the seed coat becomes hardened if they are kept too long and germination is delayed. Germination of 1-year seed is usually about 80 per cent.

Cover Crops

Whenever practicable ground should be sown with a cover crop for digging in to increase the organic material in the soil; cover crops also take up soluble plant foods and so prevent their loss by leaching. Choice of crop depends largely on the district or the period the ground is likely to be left before required for another vegetable crop. Both barley and oats are quick

maturing and usually grow quite well even in the colder southern districts if sown now. Mustard is even quicker where conditions are warm and usually



The small New Zealand centipede, which is harmless to humans.

produces a heavier crop, but it often fails to come away from a late sowing where conditions are cold. Lupins probably make the best cover crop for digging in on most soils, as they are a legume and are a rich source of nitrogen when the nodules on their roots break down. They are, however, subject to frost damage if sown very early for overwintering in districts subject to heavy frosts, and if sown late in the colder districts they usually fail to make adequate growth before they are required for digging in. The seed-bed for a cover crop should be firm and reasonably moist and for best results the seed should be gently raked in.

Some Garden Friends

Centipede: Though the centipede can usually be considered a good friend of the gardener, it is sometimes confused with the millepede, which, though it feeds mainly on decaying vegetable matter, is sometimes responsible for damage to crops by eating the roots, or in damp situations the leaves close to the soil. Centipedes are largely carnivorous. On the first segment behind the head they

have a pair of poison claws that are used to paralyse the insects they devour. Though centipedes and millepedes have a superficial resemblance, they are easily distinguished. Millepedes have two pairs of legs on each body segment, but centipedes have only one pair. Millepedes have rounded bodies in cross section, no poison legs, short antennae, and no distinct head; they are slow moving and often curl up if disturbed. Centipedes are usually somewhat flattened and have an easily-discernible head with waving antennae, and, like most other predacious insects, they move about rapidly. The small New Zealand species are harmless to humans.

Garden spiders: Few groups of animals are more feared than spiders, but few deserve it less. There is a surprising number of different species of spider in most home gardens and all do good work by destroying harmful insects. All spiders have a pair of venomous jaws which they use to good effect on their prey, but in New Zealand,

with the exception of one species, none can inflict a bite that is serious in its result to humans. Serious effects attributed to spiders' bites are usually due to the wound becoming infected or occasionally to a run-down condition or allergy similar to that occasionally responsible for serious results following a bee's sting.

Two common spiders are illustrated. The common orb weaver, probably the best known, is to be seen in every home garden, usually sitting in the



Common orb weaver.

centre of its orb-shaped web. From the time it is a minute creature until it is fully grown and capable of catching quite large



Hunting spider.

insects it does an enormous amount of good in keeping down harmful insects. The hunting spider, which is commonly found during the day under stones and pieces of wood, also does a great deal of good by destroying harmful insects, frequently in their larval state.

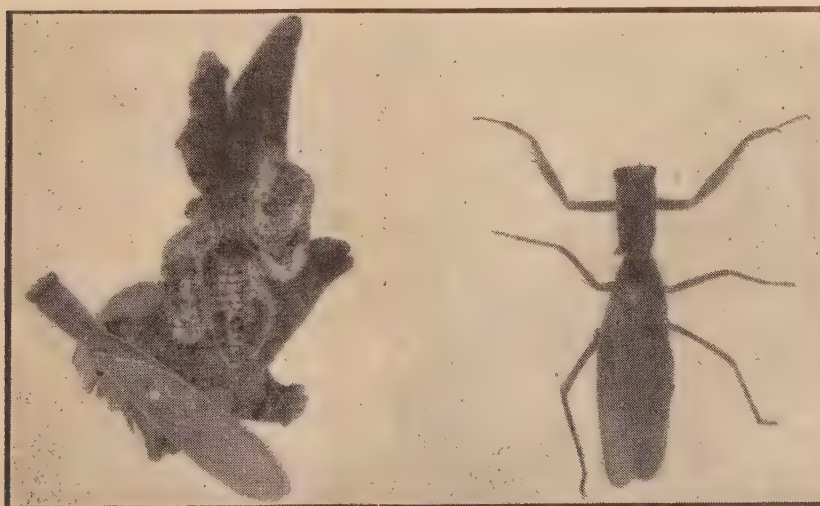
Hunting beetle: The hunting beetle is one of the carnivorous ground beetles or carabs of which there are many species in New Zealand. The specimen illustrated is shining jet black; a similar but more handsome species which is dull black when in the shade, though of a metallic green when the light shines on its wing cases, is also commonly found in the garden. These beetles and their larvae are good friends of the gardener. The beetles are rarely seen in the daylight except when turned up by the spade; usually they are found in loose soil or under stones or other objects where they burrow for shelter. The larvae have powerful jaws and long bodies coloured brown to cream; they are often turned up during digging.



Carnivorous ground beetle.

Mantis: Known as the praying mantis because of its characteristic attitude of prayer, the mantis might better be known as the "preying" mantis, for it has a voracious appetite and is exclusively carnivorous, eating other insects. Alone among insects the mantis is able to direct its gaze. It has a fine-pointed muzzle and turns its head freely on a flexible neck. It is not poisonous and holds its prey with its saw-edged forelegs, usually killing it by biting and tearing. Illustrated are some egg cases made of a foamy secretion which rapidly hardens to an almost rock-like consistency on exposure to the air and in which eggs are placed as the secretion is emitted by the female.

All photographs of insects on this page are by Green and Hahn Ltd., and are approximately life size.



Left—Mantis and egg cases. Right—Mantis, showing its saw-edged forelegs.

Vite-A-Dee

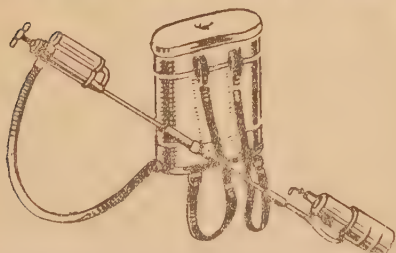
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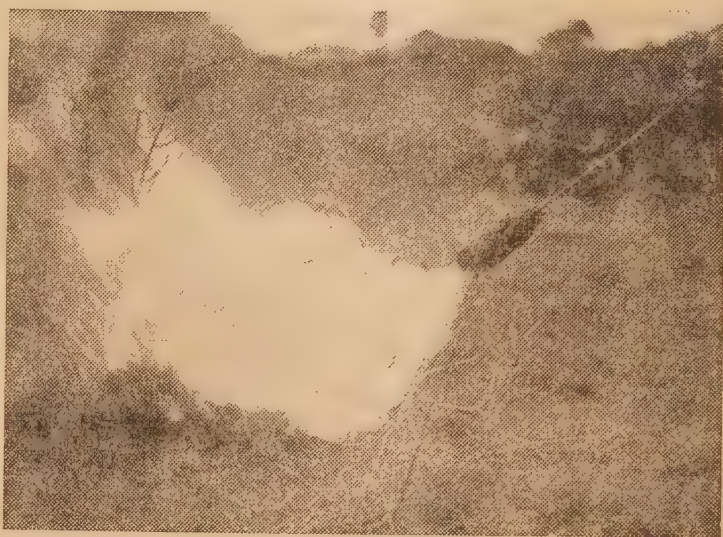
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The Development of Irrigation Farming in the United States

By N. LAMONT, *Assistant Irrigation Officer, Ashburton.*

THE history of the United States of America has been one of enterprise and achievement on a vast scale against a background of expanding opportunity provided by expanding frontiers. Against the passive resistance of immense distances and the active opposition of a warlike native population, the early pioneers steadily advanced the frontier of civilisation across the face of the North American Continent, only to hesitate at the edge of the great desert areas of the west and south-west. Then a new type of pioneer arose, spear-headed in 1847 by the Mormons, who used the ancient art of the irrigator to carry on the expansion of frontiers into the most arid desert regions. Throughout the intervening century this expansion has persisted and is evidenced today in the immense Missouri Valley developments and the million-acre Columbia Basin irrigation project. Though the airliner has replaced the covered wagon and the bulldozer has supplanted the bullock team, the United States is still a land of expanding opportunity as the desert retreats before the irrigators' persistent enterprise.

IN the south-western States there is evidence of irrigation works of great antiquity. When the first Spanish explorers moved up from Mexico they found Indian communities practising irrigation agriculture in this region. Though this Spanish-Indian combination provides the first written record of irrigation in the United States, it did not become extensive by modern standards, and the history of modern irrigation in America is generally considered to have dawned in 1847, when the Mormon pioneers crossed the Rocky Mountains and created what is now the thriving State of Utah. The fine city of Salt Lake and the many other busy towns of the green and prosperous Utah Valley are a striking monument to the vision and enterprise of the Mormon pioneers who created them from barren desert.

As its potentialities were appreciated, irrigation spread rapidly through the west. By the turn of the century nearly 8,000,000 acres were irrigated, by 1920 the figure was 19,000,000, and a slower rate of increase since then brings it to about 22,000,000 acres at present.

Rainfall Requirements

The rainfall boundary between irrigable and non-irrigable country is considered in the United States to be about 20in. annually, and this isohyet happens to coincide fairly closely with the 100th meridian of longitude, which more or less bisects the country. The irrigated areas are almost wholly in the 17 States west of the 100th meridian, but in about half of them areas are relatively small. California is outstandingly the most prominent irrigation State with nearly

one quarter (5,000,000 acres) of the country's total. Colorado and Idaho are next with 15 per cent. and 10 per cent., and, though most of the remaining States have less than 5 per cent. of the total each, that percentage represents 1,000,000 acres.

Though 20in. annually is regarded as the minimum rainfall for non-irrigated agriculture, the range of rain-falls under which irrigation is being practised in the United States is from 3in. to 90in. In the southern portion of California the annual average rainfall is little over 3in. and no form of agriculture could be practised without artificially-supplied soil moisture. At the other end of the Pacific coast, in the States of Washington and Oregon rainfall is up to 90 to 100in., but even under those conditions dry summers are sufficiently frequent to warrant supplemental irrigation.

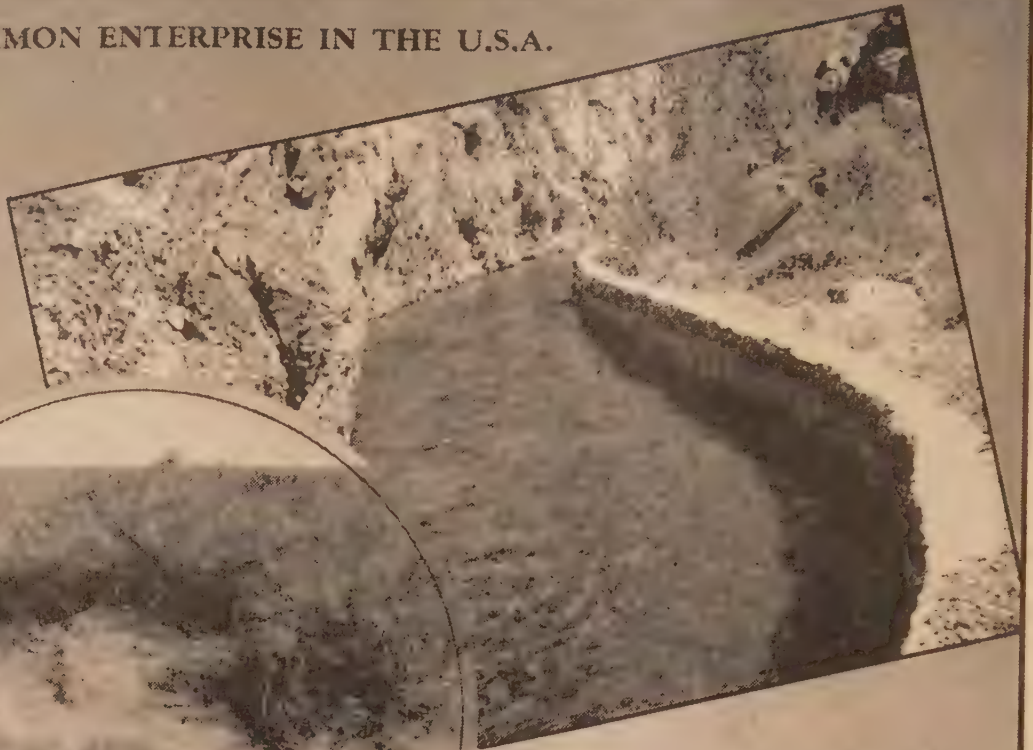
Variations of Climate

California's big advantage, apart from its dryness, is that it has a relatively equable climate because of its coastal situation. Further inland the climate is of a more extreme continental type, with summer temperatures frequently sustained for considerable periods around 100 degrees F. and winters with substantial snowfalls. Under such conditions the growing season is short—not more than six or seven months—but because of the high temperatures summer production is very high where moisture is naturally adequate or efficiently supplied. Such a climate favours an arable type of agriculture, and stock are housed, or at least fed, in sheltered yards during the winter.



The source of most irrigation water supplies in the U.S.A. is the high-rainfall mountain country. This view of the Rocky Mountains in Colorado was taken at about 11,000ft.

MORMON ENTERPRISE IN THE U.S.A.



Above—Typifying the enterprise of the pioneer Mormon irrigators is this 100-year-old canal, carved out of solid rock—no small undertaking with the facilities available in those times. Left—Desert vegetation, the raw material from which the Mormon pioneers created Utah.



A corner of beautiful, tree-shaded Salt Lake City, a monument to irrigation.

Types of Farming

To generalise about the types of farming practised under irrigation in the U.S.A. is difficult because of the extreme variation over a great area, and in many instances the farming differs so greatly from that of New Zealand that simple comparisons are impossible. One highly-important feature of the irrigated lands of the western States which is common to most parts of the area is the general high quality of the soils, which are high in the content of all plant foods except nitrogen. Having developed over many tens of thousands of years under conditions of very low rainfall with a minimum of leaching, these soils are generally rich in lime, phosphates, and other minerals. In many areas, too, the soils appear to be of uniform fine texture to a depth of several feet, and with the addition of water and nitrogen are capable of growing a wide range of crops and fruits very well indeed.

The table on page 347 shows that row crops such as maize and sugar beet play a big part in irrigation farming and lucerne is the most important single crop. In inland areas maize, a cereal, sugar beet, and lucerne would be a common type of

IRRIGATION IN THE U.S.A.

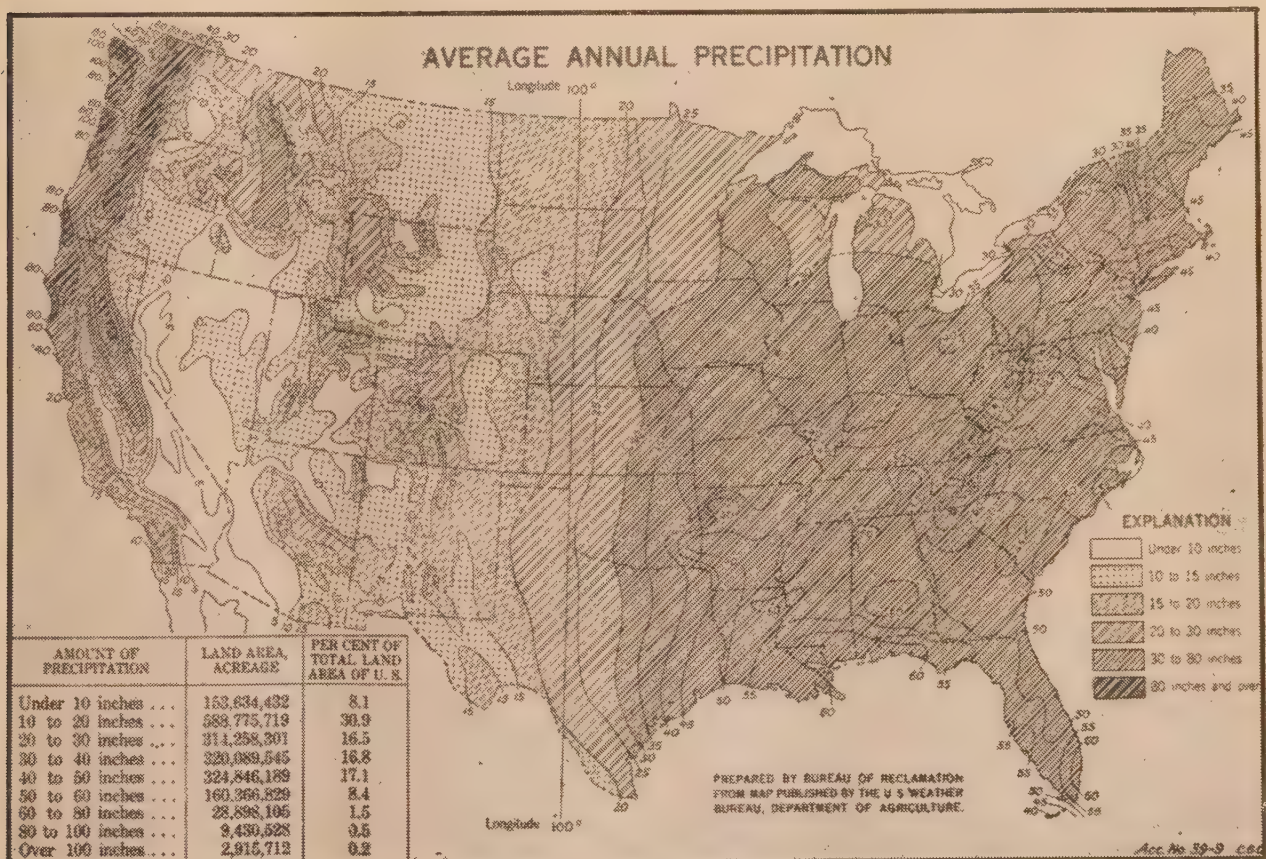


"Strip" wheat farming under a natural rainfall of 12 to 15 in. a year.

rotation and there might be little or no pasture except perhaps on a steep piece of ground not suited to cropping. A typical farm, probably of 80 to 160 acres, would have few fences, even on the boundaries, but would have a stockyard or lot where the livestock of the farm are fed on corn silage, lucerne hay, beet top silage and

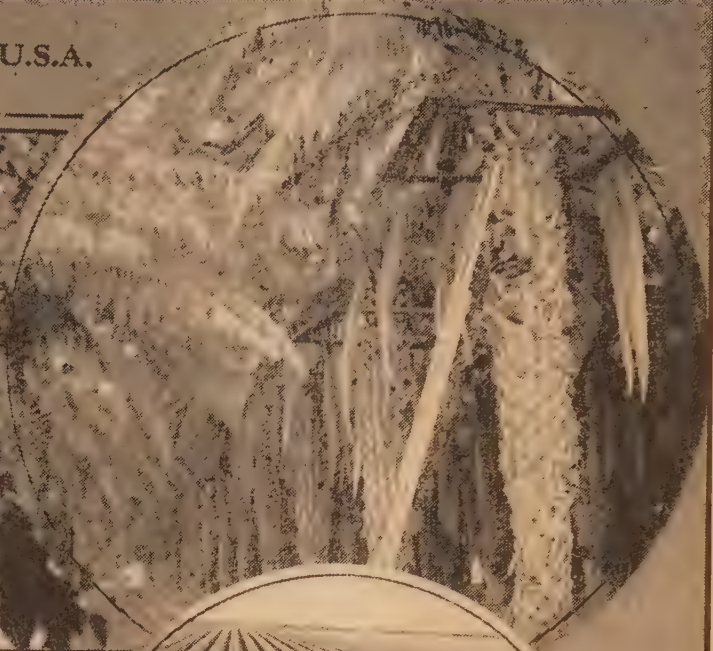
beet pulp, meals, etc. The fertility of this continual row cropping in terms of soil nitrogen is severe, but with adequate lucerne in the rotation, plus effective use of stock manure, soil fertility is maintained.

From the central States toward the north-west Pacific coastal region, where conditions closely resemble



A map showing the annual distribution of rainfall in the United States.

IRRIGATED CROPS IN THE U.S.A.



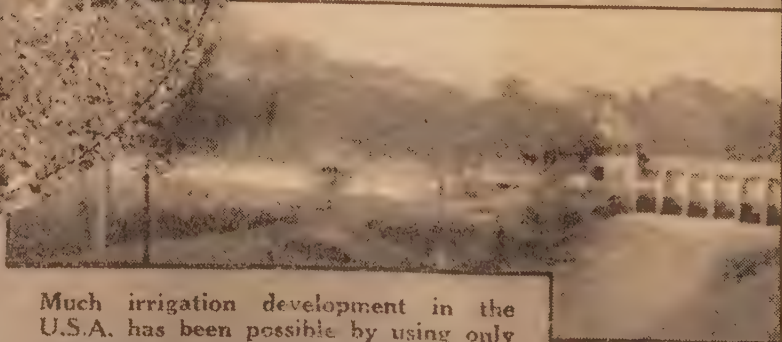
Above—Cotton in the San Joaquin Valley of California (left) and a date crop in Arizona.



Row crops are an important part of American irrigation agriculture. The immaculately-cultivated 200-acre field of lettuce in the illustration above was in the Salinas Valley of California.



Sugar beet is another important irrigated crop. In the picture above it is shown being harvested by a machine which digs, tops, and roughly cleans the crop.



Much irrigation development in the U.S.A. has been possible by using only simple river diversion structures such as this weir at Sunnyside, Washington.

New Zealand pastoral farming, the use of irrigated pasture increases. Indeed, on the Pacific coast in the States of Washington and Oregon resemblances to New Zealand include not only pastures, dominantly ryegrass, cocksfoot, and white clover, but waste spaces covered with bracken, broom, and blackberry, and in some cases quite severe ragwort infestation. Southward down the Pacific coast into California dependence on pasture decreases somewhat and something between the all-grass farming of the north-west coast and the all-crop farming of the inland States is found.

On the whole, however, the irrigation agriculture of the U.S.A. is dominantly cropping, with only a little more than one-tenth of the irrigated area in pasture. But as that tenth accounts for more than 2,000,000 acres, there is much to be seen and learned from pasture irrigation methods there. Furthermore, there is no doubt that the present trend is toward an increasing appreciation of the value of high-producing, well-managed pasture as a source of feed for live-stock.

PRINCIPAL IRRIGATED CROPS IN THE U.S.A.

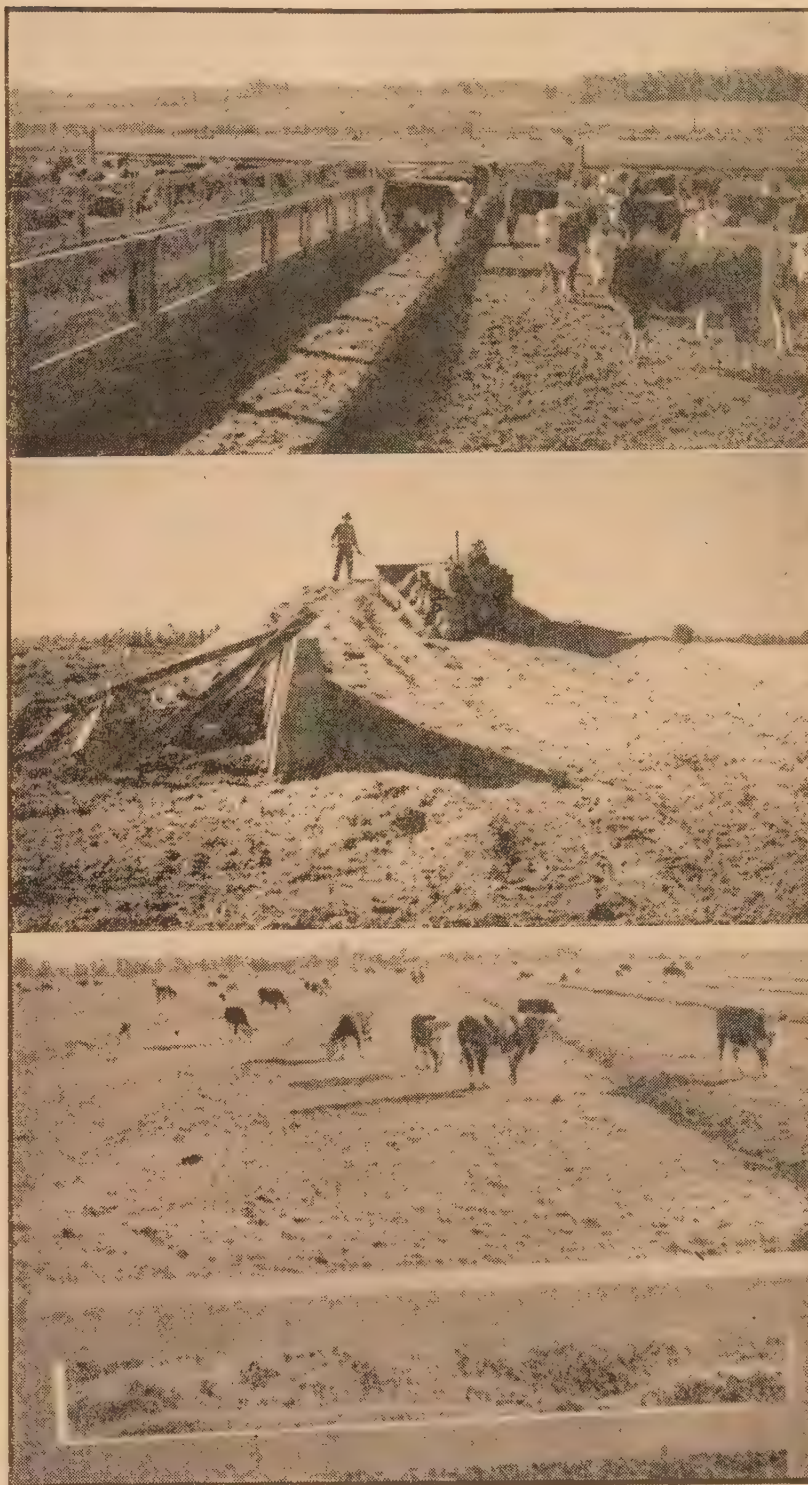
	Percentage of irrigated area
Lucerne	22
Other hay	15
Orchards, vineyards, etc. .	9
Maize	5
Wheat	5
Other cereals (oats, barley, etc.)	9
Rice	5
Cotton	4
Sugar beet	4
Beans	4
Potatoes	3
Miscellaneous	4
Pasture	11
Total	100

Only another tenth of all irrigated lands is producing fruits or nuts. Somewhat glamorous products such as citrus fruits, grapes, dates, nuts, prunes, avocados, and persimmons tend to receive more publicity than their area warrants, though these and the more common fruits are usually a highly-profitable form of irrigation agriculture, yielding very high financial returns from very small areas.

Sources of Water

Probably also accorded disproportionate interest because of the glamour associated with them are the immense dams such as Grand Coulee and Boulder. They are undoubtedly fine feats of engineering and magnificent structures, but only about one-sixth of

FARMING PRACTICES ON IRRIGATED LAND



Upper—Much livestock is fattened on “dry lots,” where it is hand fed on such crops as silage and lucerne hay. Middle—Spreading chopped maize with a bulldozer in a silo of about 1000 tons capacity. Lower—Cattle fattening on border-irrigated pasture in Arizona.

IRRIGATED LANDS OF THE U.S.A.



The scene above is typical of the misty north-west Pacific coast where land is irrigated despite rainfall of up to 90in. a year.



The giant saguara cactus dominates the upper illustration, a scene in the desert country of Arizona. The lower picture shows a section of Wyoming's "purple sage" prairie, some of which is being developed for irrigation.

A few miles from the undeveloped desert country shown above is the famous irrigated orchard area of the Yakima Valley, Washington, on the right.



irrigation in the U.S.A. comes from any form of storage dams. About half of all irrigation water is supplied by simple diversion from streams and rivers and the remaining third by pumping. This last figure, which is rather surprising, has been made possible principally by modern efficiency and operational cheapness of pumps powered by electric or internal combustion motors.

Because in the early days much land could be irrigated by simple diversion from convenient streams, nearly two-thirds of all irrigation development in the U.S.A. has been the result of enterprise by individuals, singly, in partnership, or in co-operative groups. Larger corporate bodies account for more than one-sixth of development, commercial concerns for only 5 per cent., and the Federal Government for the remainder.

Bureau of Reclamation

The U.S. Government's Bureau of Reclamation, which has been responsible for about 15 per cent. of irrigation development, and there is no doubt that the bureau will play an increasingly-important role as irrigation proceeds. It is estimated that water supply in the western States is adequate for a further 20,000,000 acres of land, but reclamation is likely to prove difficult and expensive. Naturally, areas easy to develop have been reclaimed first by small private interests, and the lands remaining are those difficult of access, difficult to level, relatively remote from water supply, or for some other reason unattractive to private enterprise.

The success of the Bureau of Reclamation in developing such areas largely depends on its efficient use of what it terms the multi-purpose approach to resource development, which consists of planning works so that one structure is used to provide electric power, regulate navigable waterways, and check floods, as well as providing storage for irrigation. In practice that has meant that development costs on the average have been only half of what they might have been had

IRRIGATION IN THE U.S.A.



Probably the really significant measure of irrigation benefits lies in attractive farm homes, such as this farmstead in Idaho.

the irrigation interests been required to find the whole cost.

Benefits of Irrigation

Some of the illustrations will demonstrate more emphatically than words or statistics the transformation brought about through irrigation in the western U.S.A. Much of the desert lands of Utah, Idaho, Arizona, California, and other States was incapable of supporting any animal life but rattlesnakes until irrigation made them bloom into prosperity. However, irrigation has not been restricted to arid desert; in many areas now irrigated large-scale cattle ranching or "dry-land" wheat farming had been practised more or less successfully, though subject to periodic disaster through drought.

Before being irrigated, much of this prairie, "purple sage" country would support only one cattle beast to each 15 to 30 acres, and wheat was grown under the alternate crop-fallow system. Under that system no crop but wheat is grown and the rotation is

simply wheat and bare fallow in alternate years to conserve moisture. If the fallow is clean, with all weed growth thoroughly suppressed, moisture is conserved in the soil and in effect one crop is grown on two years' moisture. Long-term experiment has shown that under this system the yield obtained in alternate years is more than twice that obtained by annual cropping. As a protection against wind erosion wheat and fallow are laid out in strips across the direction of the prevailing wind, and from the air the land presents a striking pattern of grey and brown stripes like a great awning tens of thousands of acres in extent.

Finally, irrigation is now extending into country previously considered amply supplied with rain and where already successful mixed crop and livestock farming is practised. In the high-rainfall eastern States and in the Pacific north-west, on the Oregon coast and in the "evergreen State" of Washington, supplemental irrigation is becoming recognised more and more, as it is in New Zealand, as a vital factor in productive efficiency under dry summer conditions, despite the fact that the annual rainfall may average 50 in. or more.

To the westerners of the U.S.A. irrigation agriculture is the foundation of existence and their hope for the future. It is significant that whereas the last Census decade showed an increase in population over the whole United States of 6.5 per cent., the irrigation country's increase was twice that figure. With the prospect in sight of almost doubling the present area of irrigated lands, the future contribution of irrigation agriculture to the wealth of the country is beyond computation.



A large flame-thrower being used for weed control on a canal bank. With so much row cropping, water-borne weed seeds are a serious nuisance.

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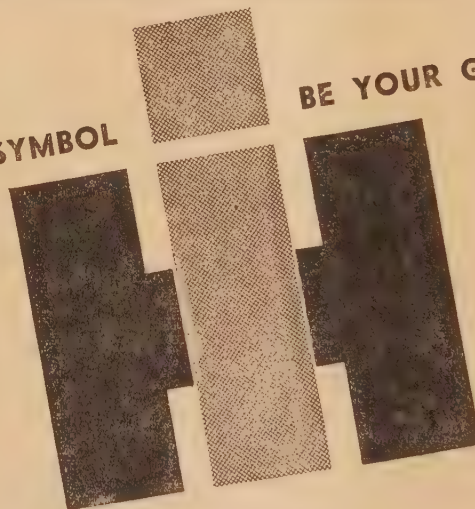
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Control of St. John's Wort by Imported Beetle

By D. MILLER,
Cawthron Institute, Nelson.

WHEN the noxious weeds control scheme (financed by the Empire Marketing Board, the Department of Scientific and Industrial Research, and the Cawthron Institute) was inaugurated in 1927, St. John's wort was one of the weeds on the list of those to be dealt with. The objective was control by means of insects, having in mind the successes attained by this means against lantana in the Pacific and prickly pear in Australia. However, as special researches into the control of St. John's wort were being undertaken by the Australian authorities, both in the Commonwealth and in Europe, it was decided not to duplicate this work unnecessarily in New Zealand but to concentrate on other local problems under the scheme, such as gorse, ragwort, and piri-piri.

ST. JOHN'S wort (*Hypericum perforatum*) has been spreading on valuable country, displacing pasture and becoming a danger to livestock, especially sheep, because of its poisonous nature. The poisonous principle in St. John's wort is hypericin, which stimulates a photo-sensitisation and dermatitis, especially on the ears and muzzle in breeds of sheep having unpigmented skins; the wool sloughs off, and the animals become depressed or excited and cannot be driven across



[R. Blick photo.]

water or through a dip without drowning. Dark-skinned sheep (such as the Suffolk) are not affected.

Apart from the beetle *Chrysolina hyperici* others have been established successfully in Australia, but no attempts will be made to use any of these in New Zealand unless *C. hyperici* fails to control the wort in all climates.

Australian Researches

The Australian authorities first conducted extensive researches into the insect fauna of St. John's wort in Europe and England. A great many insects were found feeding on the weed. After careful study a few species were selected and sent to Australia, where they were intensively studied and rigorously tested on a great variety of plants to ensure that they confined their attention to St. John's wort or other species of the genus at most. Some passed these tests and were liberated, and among them was the beetle *Chrysolina hyperici*, which is now being dealt with in New Zealand.

After being freed in Australia, however, *C. hyperici* disappeared and was written off as a failure, but after some 10 years it reappeared, developed rapidly, and began to clear up extensive areas of St. John's wort. At that point supplies were secured for New Zealand.

Work in New Zealand

In December, 1943, through the courtesy of Dr. A. J. Nicholson, Director of the Commonwealth Entomological Service, two cages containing some 30,000 *C. hyperici* beetles were received from Mr. T. Campbell. These were sent by air; they left Australia on Thursday, December 16, reached Nelson the next day, and most of them were liberated on a St. John's wort area in Marlborough on December 18. On December 21 the remainder of

the shipment was liberated. On arrival and before liberation the beetles had to be removed in the quarantine room from the cages in which they had come from Australia and transferred to others, so that any unwanted insects could be segregated and destroyed.

The experimental area has been examined each December since 1943. In 1944 the beetles had become established and had completely cleared the weed from areas up to 80 square yards, the insects being present in great numbers; by the following December the cleared areas had extended, and by 1947 more than 400 acres were cleared and dense pasture had become established in place of the weed. So abundant have these beetles become that the St. John's wort is seen to be literally black and weighted down with them, and anyone walking over the cleared ground behind where the insects are at work crushes the beetles under foot.

By December, 1946, the beetles were sufficiently numerous to allow the first liberation to be made in Central Otago, and in 1947 major distributions were made on wort areas in Canterbury and Otago.

Life History of Beetle

In England the eggs are laid on the young undershoots of St. John's wort during autumn and early winter and they hatch during spring. Larvae are active throughout spring and summer and pupae occur during the same periods. The adult beetles appear in early summer, vigorously attack the St. John's wort for about two months, mate, and begin laying eggs; the beetles are to be found throughout autumn and early winter. The life history has not yet been studied in New Zealand, but it appears to follow much the



[R. Blick photo.]

St. John's wort being attacked by the *Chrysolina hyperici* beetle.



[R. Blick photo.]

St. John's wort defoliated by the *Chrysolina hyperici* beetle.

ST. JOHN'S WORT BEETLE

same course as in England. However, eggs have been found in December on both the plant and under stones.

As well as St. John's wort, the beetles feed ravenously in the laboratory on tutsan (*Hypericum androsaemum*); if they do so under field conditions, it will prove of great value. Tutsan is sometimes called borewood.

Annual Distribution

Each year in December it is intended to distribute this beetle further afield and establish it on the St. John's wort



[After F. Wilson.

The St. John's wort beetle: Larva (upper), eggs, and adult.

and later the tutsan areas of New Zealand. The only practical means of doing that is to send consignments for liberation by the Fields Division staff of the Department of Agriculture; it is impossible to send consignments to individual farmers, as the demands could not be coped with.

For the initial establishment of the insect it is essential to concentrate it in large numbers on one area in a district; once established the beetle will spread rapidly throughout a region, but a few years must elapse before sufficient populations can be built up to have any noticeable effect on the weed.

A Fertiliser Sowing Bag

By E. G. STAINTON, *Fields Instructor, Department of Agriculture, Taumarunui.*

IT has been found by practice that hill-country pasture topdressing, much of which has to be done by hand, can be carried out most easily and economically by using four men and three pack horses, one man doing the packing and the other three the sowing. Essential to efficient working is a handy type of sowing bag, and in this article the making of a suitable bag is explained.

TAKE an empty fertiliser bag, lay it flat on the ground, and fold the mouth end down to about a third of the length of the sack. Tie the two corners brought over to the sides of the bag with strong twine, thus forming openings for the arms. Now make a cut from the centre at the top of the sack about 8 in. deep through the four thicknesses of the folded material. This gives an opening for the operator's head (Fig. 1). Turn the bag over and cut the single sacking the full width of the material to form the manure container (Fig. 2).

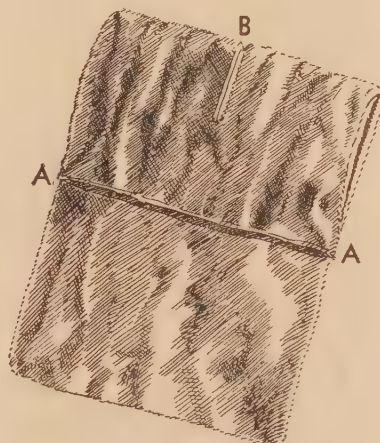


Fig. 1. Back view of the bag. AA—The two corners brought over and tied to the sides of the bag with strong twine. B—The 8 in. cut in the top of the sack to provide an opening for the operator's head.

This completes the bag, which is similar to a rough, strong waistcoat supporting a large sacking container which will hold 65lb. of superphosphate (a third of a bag).

Time and Energy Saved

When three sowers are employed a bag of fertiliser is emptied to fill three sowers' bags. This means that the sowers do not have to return to that particular bag of fertiliser. The three men proceed with the topdressing and, provided the pack-man is working efficiently, another bag of fertiliser is ready as the sowers run out of manure.



Fig. 2. Front view of the bag. C—Opening for the operator's head. D—The cut the full width of the single sacking made to form the manure container.

In this way much time and energy are saved, as the men are sowing all the time instead of tiring themselves by walking back over hilly country, already topdressed, to a partly-emptied sack of fertiliser.

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

May 3—"Current Farming Problems," by J. E. Davies, Instructor in Agriculture, Department of Agriculture, Hamilton, and G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

May 10—"Good Seeds," by A. V. Lithgow, Liaison Officer, Seed-testing Station, Palmerston North.

May 17—"Production Results from Artificially-bred Heifers," by S. A. Southcombe, Technician, Animal Research Station, Ruakura.

May 24—Young Farmers' Clubs session, by a member of the Warkworth Young Farmers' Clubs District Committee.

May 31—"Fruit Varieties for the Home Orchard," by I. L. Nottage, Orchard Instructor, Auckland.

Improving Pastures in Auckland Province



ALMOST all the meat, wool, and dairy produce from farms in Auckland Province comes from permanent pastures. On most farms pastures in different fields vary greatly in their productivity, and a study to determine the reasons for that difference and to devise methods of improving the poorer ones is one of the most important that can be undertaken.

By J. E. BELL, *Fields Superintendent, Auckland.*

THE development of a pasture can be affected greatly by its treatment at or close to sowing time. With the probable exception of problem soils, which are not dealt with in this article, the factors which influence the pasture's future are the state of the seed-bed, the amount and kind of fertiliser and lime applied at sowing time, the time of sowing, the rate, and the kind of seeds sown.

The effect of those factors is very great in the first year of the pasture's life and then gradually diminishes until it becomes negligible. Nevertheless they are very important because, if the return from the new pasture is small, not only is valuable production lost but the farmer cannot so well afford to spend money on maintaining and improving the sward in future years. Particularly is that so when a new block is being broken in and the farmer will depend entirely on production from new pastures; therefore every care should be taken at the outset to ensure successful establishment on such areas.

State of Seed-bed

At the time of sowing the seed-bed should be reasonably well-drained, mellow, firm, and fine. On very light soils difficulty is experienced in making the seed-bed firm, and if possible extra heavy rollers should be used. After being ploughed the furrows should be rolled in the direction of the ploughing. When the ground has been worked to a fine tilth it should be rolled before being sown and again after a harrowing to cover the seed.

Time is necessary to make a heavy soil mellow and to break it up to a fine texture. That is best achieved by deep ploughing about May, leaving it to lie fallow through the winter, discing and reploughing about October, and following this treatment with discings and harrowings during the summer.

Fertilisers and Lime

The soils of Auckland Province are naturally very poor in fertility, so the application of fertilisers and lime is of great importance. Under low fertility the poorer-producing species will live but the more highly-productive ones will die or barely exist.

Lime is necessary except on soils such as the pumice soils and some recently derived from basalt or raw sand. On heavy, sour soils lime should be applied at 1 ton an acre, with smaller amounts for soils less deficient. If heavy dressings are required, the lime should be applied two or three months before sowing.

Phosphates should be applied to almost all soils at 3 or 4 cwt. an acre at sowing time, and if superphosphate is used it should be sown separately from the seed. On soils very deficient in potash, such as some of the basalts, the soils on the rolling country at Waihi, and the Horotiu sandy loam and peats, $\frac{1}{2}$ to 1 cwt. an acre of muriate of potash or 1 to 2 cwt. of 30 per cent. potash salts should be applied separately from the seed.

Throughout Auckland Province dairy production comes almost entirely from permanent pasture.

Time of Sowing

The best time to sow seed is just before the autumn rains, which usually fall in March. In cold climates and on cold, heavy soils early sowing should be attempted—February is probably the best time. On light soils and in milder climates April is not too late, though March is usually the best month.

Rate of Sowing and Kind of Seeds

For best results in the first year about 40 lb. of seed should be sown. For the average soil type, which is a clay loam in a mild climate, the following mixture is recommended for a dairying pasture:

	lb. an acre.
Certified perennial ryegrass ..	15
Certified short-rotation ryegrass	10
Certified white clover	2
Certified cocksfoot	6
Crested dogstail	2
Paspalum	4
Cowgrass	3
Lotus major	$\frac{1}{2}$
	42 $\frac{1}{2}$

For sheep farms, except on very fertile or wet soils, include 2 lb. of subterranean clover. In cold climates sow 10 lb. of Certified cocksfoot and no paspalum. In very wet climates and damp soils include 4 lb. of timothy. On soils of very high fertility leave out dogstail and subterranean clover, and, where conditions are not wet, *Lotus major*. Ensure that the seed is of a high standard of purity and germination.

Certified seed should always be ordered unmixed in sealed containers. Inspect the purity and germination certificate held by the merchant, which shows the same number as that on the tag on the bag of Certified seed. Small

IMPROVING AUCKLAND PASTURES . . .

quantities of any of the species certified should be available from the merchant, who can arrange for bags of suitable size to be sealed and tagged by Departmental officers for the convenience of the farmer.

Development of New Sward

If the state of the seed-bed is good, if ample fertiliser of the right kind and lime are applied, if sowing takes place at the best time, and if the rate of sowing and kind of seed sown are satisfactory, there is no doubt that the pasture will develop into a first-class sward from the start. If, however, as has frequently occurred in the past, the new pasture does not receive its due, a good start is not secured. All the factors quoted are important—for example, the best of seed and fertilisers cannot bring success if the seed-bed is improperly prepared and sowing is late; some of the pasture species may live and in time develop into a good sward, but in the meantime there is loss of production and loss of money which would be used to improve the pastures on the farm.

Important as the nature of a seeds mixture is, it fades into relative insignificance if one or more of the many other factors of soil conditions are not right. However, one definite piece of advice may be given to the average farmer, and that is always to sow Certified perennial ryegrass and Certified white clover.

Uncertified ryegrass and white clover often give disappointing results for at least three or four years, by which time, if fertility conditions permit, the sprinkling of better strains gains ascendancy over those which have died or been subdued. Smaller sowings of the better strains result in thinner stands in the first year and therefore less production, but after that the pasture should thicken if well

fertilised. Generally it pays to sow about 40lb. of seed an acre; the gain in production in the first year more than compensates for the extra cost. Much heavier sowings do not appear economic. It pays better still to sow the best available strains of the species which will be most prominent in the sward as the years go by. This article does not deal with special-purpose mixtures for peat, sandy, or wet areas but only with those for the general soil types which cover more than 95 per cent. of Auckland Province.

If the seed-bed is not given sufficient fertiliser or lime or is improperly prepared, or if sowing is late, clovers may not strike or, if they do, the seedling clovers may die. Production will then be very poor for the first two years and, if clovers do not come into the field before the end of that period, the ryegrass will probably die, leaving a field containing a variety of poor-producing grass, weed, and clover species that happen to come in and suit the conditions.

Whether clovers come into the sward or not before the pasture is two years old depends largely on how well the soil is treated with fertilisers and lime. Given good treatment, the clovers increase rapidly in cover and vigour and ultimately a high-class sward results, but too often the mistakes in establishment are not corrected in this way and better species disappear or become stunted in growth, leaving the field to inferior pasture species.

Improvement of Poor Swards

An important part of farming in Auckland Province is the improvement of poor swards by raising the fertility of the soil by topdressing. Whatever else is done, that must be done first, for the poor sward would not be derelict if it had received

reasonable treatment with fertilisers and lime, even if the major proportion of the plants that established were of a poor strain.

Oversowing high-quality white clover and ryegrass on a soil of poor fertility is no use unless the fertility of the soil is being improved. The fact that the species present are not thriving is evidence that there is a deficiency of some kind which should be met by applications of phosphate, potash, or lime, or a combination of two or three of these. The effect of such applications to a poor sward where some clover is present is often surprising. The first effect of the topdressing is to make the clovers present grow better and spread out, suppressing inferior weeds. When the ground is well covered with clovers they compete among themselves for supremacy. Slow-growing clovers are quickly subdued by ones of faster growth and as the sward thickens annual clovers, even of the more highly-productive types, are repressed.

When conditions are suitable for it a perennial will usually oust an annual, for the annual as a young seedling has to fight for a place in the sward each season against established perennial plants. Of the annual clovers, one of the first to succumb in an improving sward is *Lotus hispidus*. The topdressing encourages it to grow vigorously with any other clovers present, and together they suppress weakly-growing weeds. As well as *Lotus hispidus*, suckling clover, subterranean clover, *Lotus major*, and white clover are frequently present in such swards. After *Lotus hispidus* the low-producing annual suckling clover and the comparatively low-producing permanent clover *Lotus major* give up the struggle, leaving the more highly-productive annual subterranean clover and perennial white clover to fight what is often a long-drawn-out struggle. If moisture conditions in summer suit white clover sufficiently, it becomes the dominant clover species and may oust the subterranean clover.

As clovers assume control the nitrogen status of the soil is improved, and by the time subterranean clover or white clover or a mixture of both assumes charge it is sufficiently high to make the growth of ryegrass vigorous enough for this highly-productive grass to compete with inferior grasses in the sward. Not having the ability of white clover to cover the ground, ryegrass does not eliminate all the inferior grasses speedily, but it gradually assumes charge of the sward if the improvement of the nitrogen status of the soil continues. The increased stocking of the area resulting from the improvement caused by the fertiliser applications brings added fertility, which further assists to bring



A lumpy, unconsolidated seed-bed is unsuitable for the establishment of high-quality pasture.

ryegrass and better grasses into prominence, until they become dominant; all inferior grasses may then be eliminated.

That is a general history of all too many pastures in Auckland Province, of which it can be said that the seed mixtures sown had no great influence on the swards that ultimately resulted. There has certainly been an improvement in recent years, as most farmers have found better methods of laying down a permanent sward and treating it so that it is maintained from the start. Nevertheless, farmers still spend a great deal of their time and money in correcting mistakes made in the not far-distant past, chiefly by liming and manuring until soil fertility is raised sufficiently to carry a good sward.

Introduction of Better Species

With the cost of fertilisers advancing, the argument in favour of re-seeding is becoming stronger, but Auckland farmers are notorious for their dislike of the plough. There have been instances of farms taken over with all or almost all of the pastures in a poor state on which some fields were ploughed, resown, and manured and others were only top-dressed to improve the pastures; today there is no apparent difference, though the ploughed and resown areas may have had an improving effect on the other areas by the introduction of more of the better species on the farm, subsequently to be dispersed over it by stock and the feeding out of hay. The crops taken before grassing may have been worth while, but the economic value of such methods is doubtful in view of the improvement that is more easily attained by applying fertiliser and lime. However, it should be stressed that this can be successful only where some clover is present; if not, it must be introduced.

Often the question of whether to improve by ploughing and resowing is determined by whether ryegrass-white crops can be produced before the land is sown to permanent grass. Much of the poorer, heavier country of North Auckland does not produce worth-while crops and improvement is better attained by topdressing. Surface sowing certainly appeals more to the Auckland farmer, and it may be particularly valuable for the introduction of species of high quality not already there, and must be used where clover is not already present, but much seed is wasted in that way. For successful surface sowing the ground must be fairly bare so that surface cultivation with penetrating harrows can produce a good seed-bed. A pasture containing a thick mat of any grass or clover is difficult to improve in this way because a good seed-bed cannot be secured. Wherever the sward is thin, however, the attempt should be made. More work is required to surface cultivate heavy

IMPROVING AUCKLAND PASTURES



[Sparrow Industrial Pictures Ltd. photo.]

The use of fertilisers is essential on most soils in Auckland Province.

soils and the work cannot be done on most soils while the ground is dry and hard. Perhaps surface cultivation should really be started on heavy soils in the late spring so that a good seed-bed can be produced for sowing early in the following autumn.

Nevertheless, the transformation brought about by topdressing alone is frequently amazing. A sward containing chiefly sweet vernal, flat weeds, some stunted ryegrass, and a very few poor specimens of clovers was changed in three years to a ryegrass-white clover pasture, but with still a fair proportion of sweet vernal. It might have paid to introduce the best strains of ryegrass and white clover after a proper seed-bed had been prepared, but such a seeding would have been of little use without the fertiliser.

Testing for Fertiliser Requirements

The first step in improving unthrifty swards on the major portion of Auckland Province is to find out the soil's requirements of phosphate, potash, and lime. When they are known it may pay to introduce better species as well as to apply the fertilisers and lime required. The most practical method of testing soils is to apply the fertilisers and lime and watch for the effects described on the unthrifty sward. Topdresser widths of the following treatments can be placed across the middle of the field and properly marked for observation:

1. No treatment.
2. Superphosphate, 3cwt. an acre.
3. Superphosphate, 3cwt., and lime, 1 ton an acre.

4. Superphosphate, 3cwt., lime, 1 ton, and muriate of potash, 1 cwt. an acre.

Speedy results may be obtained from the superphosphate and potash, but the lime usually does not show its best effect until the second summer after the treatment.

If all three treated plots are equally good and better than the untreated plot, dressings of phosphate are all that is necessary. However, if plot 3 is better than plot 2, dressings of lime are required; if plot 4 is better than plot 3, potash is necessary. The quantities to be applied can be determined approximately by the effect on clover growth.

That system has been used by the Fields Division of the Department of Agriculture for many years and is used by a few farmers. Officers of the Division have thereby built up and are still building up valuable information about many soil types. With the soil chemist now coming to his assistance, it is hoped that Instructors in Agriculture will soon be in a position to give greater help to farmers in this important problem, which must be solved before any improvement can be made on most of the pasture lands of Auckland Province.

On some areas such as the Hauraki Plains better drainage is the problem of prime importance, and there fertilisers and lime have little or no effect. Others, such as the ironstone soils, the deeper peat areas, and leached sands such as the Te Kopuru sands, are problem soils, the requirements of which are still under investigation.

Replacement of Apple Trees on Moutere Hills Orchards

By N. J. ADAMSON, *Horticultural Superintendent, Nelson.*

THE economic life of an orchard is a subject frequently discussed. In the first instance the life of a fruit tree depends on the suitability of its environment (such factors as soil and drainage), the root stock on which it is grown, and its general treatment during its lifetime. The profitable life of an orchard may extend long beyond the life of the most vigorous fruit tree in it if the fertility of the soil is maintained and worn-out trees are replaced regularly with new trees on suitable root stocks.



Above—A 15-year-old Granny Smith replacement on seedling stock. Below—A Granny Smith reworked from Worcester Pearmain in 1931. The original was on Northern Spy planted 35 years ago.



DURING the war few if any new pip fruit trees were planted in New Zealand and their total acreage was reduced. Because of the depletion of nursery stocks, new planting either by extension to existing orchards or by the establishment of new units is being unavoidably delayed, so for a good many years the bulk of apples and pears must be produced in existing orchards. Maintaining the present acreage and providing for regular replacements to prolong the profitable life of existing orchards are good economy.

Sooner or later trees will deteriorate beyond a point when their retention is economic, and their replacement is then necessary; other trees are lost through such causes as accidents and silver blight infection after reworking. The rate of replacement varies with variety, root stock, and condition of soil. On deep alluvial soils with perfect natural drainage, allowing a free rooting system, trees have a longer life than on shallow soils or those with a more retentive subsoil which may feel the effects of drought.

Apple varieties have shown definite differences in the period over which they remain healthy. For instance, Cox's Orange Pippin become rather debilitated at a period when Jonathan and Sturmer Pippin under identical conditions are still healthy and productive. Gravenstein also show a relatively-early decline because of the gnarling of main limbs peculiar to this variety. On the better soil types these differences appear later.

Influence of Root Stocks

Root stocks have a marked influence on the health and vigour of apple trees, and certain types of stocks lengthen the period of high production as compared with Northern Spy, the root stock most commonly used for many years. This influence is more marked on the poorer soil types used for apple growing. Where such stocks have been introduced there is sufficient evidence to give a lead for future planting and especially for replacements.

In the past difficulty has been experienced in satisfactorily establishing a tree grown on Northern Spy stock as a replacement. For that reason gaps have been left where trees have died and many debilitated trees have been retained beyond their economic life. That condition has been more pronounced on the poorer soils such as the Moutere Hills of Nelson. Fortunately trees on selected East Malling and certain types of seedling stocks are able



A 15-year-old Cox's Orange replacement on seedling stock.

to succeed as replacements on Moutere Hills land. Trees on these stocks exhibit all the vigour desired for new plantings on clay soils and are recommended.

Should a vigorous policy of replacement be carried out on existing orchards there is every prospect of the production ultimately exceeding present yields. The illustrations show differences in size between original trees and trees planted as replacements 15 years ago; they are Cox's Orange, Jonathan, and Granny Smith grown in an orchard in the Moutere district. The orchard was planted in 1914, the stocks used being mostly Northern Spy as far as is known. During the life of the orchard about three-fifths of the original trees have been reworked to other varieties.

Cox's Orange Pippin and Granny Smith were grafted on to Worcester Pearmain cut down to the forks in 1930. Unsuccessful reworking and silver blight infection caused the death of a number of trees, and replacements became necessary. In 1932 gaps were filled with trees grown on a locally-raised seedling stock which had exhibited good vigour. All replacements are sturdy trees with a cropping capacity more than double that of the originals. About the same period several gaps in the Jonathan block were filled with trees grown on the same seedling stock. The replacements have exceeded the originals in growth and vigour and are now producing heavily.

Effect on Production

Taking this orchard of 2500 trees as a typical example, a survey has revealed that about 150 trees, or 6 per cent., have arrived at a stage when replacement should be considered. Trees were regarded as uneconomic and requiring replacement when production had fallen to one bushel. The immediate loss by removing 150 rather than 100 trees out of 2500 would not be appreciable, as the present capacity of the orchard is 7000 bushels annually—production during the past three seasons has been higher than at any other period of the orchard's existence. The number of trees qualifying for replacement in the 15 years since any replanting was undertaken represents a loss of only 0.4 per cent. annually.

It is estimated that 150 replacement trees should be capable of producing 450 bushels of fruit in 10 years' time. During that period, allowing a continuation of a replacement rate of 0.4 per cent., another 100 trees may qualify for removal, but the loss in production would be relatively low, as only the lower-yielding trees would be removed. If necessary replacements were attended to annually, the position would become progressively better as the newer trees of high bearing capacity reached maturity.

... REPLACEMENT OF APPLE TREES

The maintenance of soil fertility is of paramount importance in extending the life of any orchard. Soil erosion on slopes must be reduced to a minimum by all possible means. Organic matter in the soil must be built up by the cultivation and turning in of green crops, and the application of bulky organic matter from outside sources if available, first as a means of improving soil fertility and secondly as a means of increasing absorption of rain for avoidance of wash.

With proper care, good husbandry, and the regular replacement of worn-out trees with trees on suitable stocks, existing orchards, most of which are 35 years old, should be capable not only of maintaining their present production but ultimately of increasing it in many instances.

All photographs by Ellis Dudgeon.



Above—A 15-year-old Jonathan replacement on seedling stock. Below—A Jonathan original on Northern Spy planted 35 years ago.



Cox's Orange reworked from Worcester Pearmain in 1931; original on Northern Spy planted 35 years ago.



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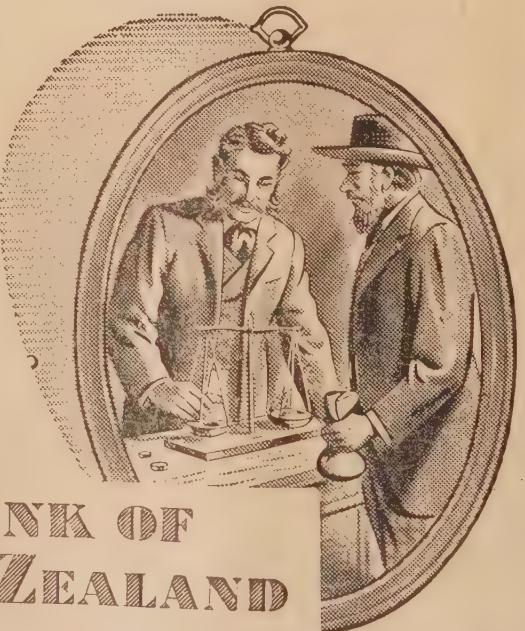
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Linseed Oil Production in New Zealand

By S. M. J. STOCKDILL, *Assistant Fields Instructor, Dunedin.*

THE value of linseed oil production in New Zealand to the primary and secondary industries of the country is well recognised today. Linseed oil in its various forms is essential for the manufacture of paints, varnishes, linoleum, rubber footwear, oilskins, stock medicines, and a multitude of other important commodities, while the by-products of the industry, linseed cake and meal, are no less valuable as supplementary fodder for stock.

IMPORTS of linseed oil and linseed cake and meal during the three years immediately preceding the war were as follows:—

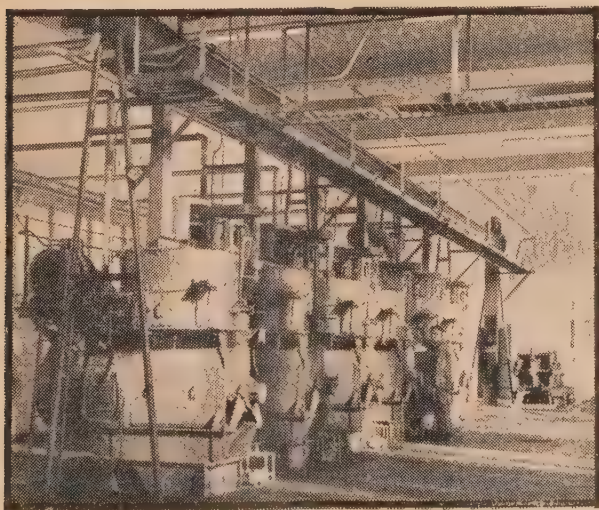
Year		Oil (gallons)	Cake and meal (cwt.)
1937		684,742	23,603
1938		833,210	25,919
1939		708,283	25,821
Average		742,078	25,114

With the greater number of secondary industries throughout the country and the ever-increasing popularity of linseed cake and meal for stock food, the present-day requirements of the Dominion may be assumed to be much in excess of those figures.

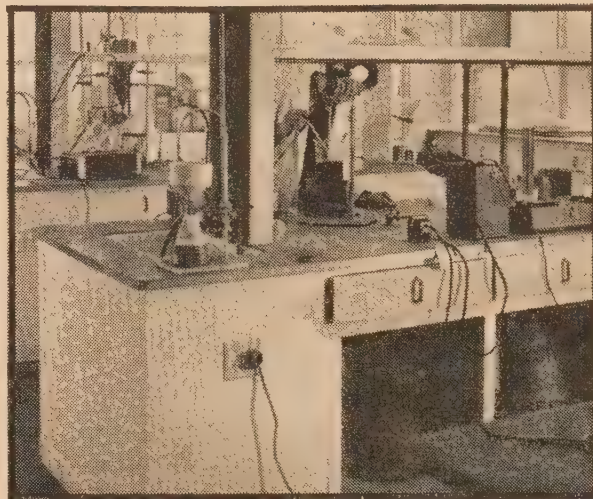
Closing of Auckland Factory

From 1921 to 1935 the New Zealand Cattle Cake and Oil Company Ltd. operated a factory in Auckland for the production of linseed oil and allied products. During that 15 years the production of this factory fluctuated somewhat, but on an average some 3000 tons of linseed were processed annually to produce about 240,000 gallons of oil and 2000 tons of linseed cake. The bulk of the seed used was produced in Canterbury and North Otago, and in some years from 10,000 to 15,000 acres were grown.

During that period it was also necessary to import large quantities of linseed oil, and when the factory closed down



In the expellers the linseed "meal" is subjected to the enormous pressure of 15,000 to 20,000lb. a square inch. This picture shows the expeller room from the intake end.



In a modern and well-equipped laboratory qualified chemists carry out all the tests necessary for the production of the highest-grade article.

in 1935 the whole of the Dominion's requirements of oil and cake had to be obtained from overseas. Australia was at that time the principal source of supply, but with the outbreak of war great difficulty was experienced in obtaining adequate supplies.

Factory Established in Dunedin

By 1942 the supply of linseed oil for essential industries was alarmingly low and at the same time the Linen Flax Committee had accumulated a considerable surplus of linen flax seed. After consultations with that committee and the Bureau of Industry the commercial possibilities of producing oil from linen flax seed were fully investigated and Dominion Industries Ltd. decided to establish a factory in Dunedin for the purpose. Constructional work was begun in October, 1942. Because of the urgency of the project the buildings were of temporary design and much of the plant had to be improvised, but by February, 1943, the factory was in operation and oil was made available to essential industries.

The need for the expansion of the industry soon became apparent and, as a result of discussions with the Supply Council and extensive investigations, the manufacturers decided to extend their operations to cover the whole of the Dominion's requirements of oil. Engineers and designers were immediately put to the task of designing a completely-new factory comprising modern storage, processing, and laboratory units and a refinery capable of producing various types of refined oils, as well as capacious office accommodation, a cafeteria, and staff amenities. In September, 1945, the original factory was swept by a disastrous fire which destroyed everything but the oil storage tanks. As a result work on the new factory, which had been started in January, 1945, was speeded up as much as possible and by February, 1946, the new ultra-modern plant was producing oil.

Because of difficulties of construction and of obtaining equipment many makeshifts were necessary at that stage, and even now the seed-storage silos, cleaning and drying plant, and vacuum system for handling the seed are not complete. However, when running to capacity this plant will produce 1,000,000 gallons of oil and about 8000 tons of linseed cake and meal annually. The factory is so constructed that extensions can be made.

LINSEED OIL PRODUCTION . . .

In the early stages surplus linen flax seed was used by the Dunedin factory, but it soon became apparent that this supply would not suffice for the required production of oil. Consequently seed of oil-producing strains, as distinct from those used for fibre production, was obtained from overseas. During this change-over from linen flax seed to linseed of high oil content a temporary shortage was alleviated by several thousand tons of linseed obtained from India. However, shortages in that and other producing countries made the importation of regular supplies of seed impossible, and, in any case, the industry has been built up on the basis of sufficient raw material being produced locally. To achieve that end it will be necessary for a minimum of 30,000 acres of linseed to be grown annually in New Zealand.

Important Cash Crop

For many years linseed has been grown fairly extensively throughout Marlborough, Canterbury, Otago, and Southland, climatic and soil conditions in those areas proving most suitable for the crop. During the war linen flax was also grown on a large scale in those districts, and the acreage of linseed grown for oil production has increased rapidly from 8000 acres in 1945-46 to 15,000 acres in 1946-47 and to more than 25,000 acres this year.

With growers becoming better accustomed to the handling and general management of the crop and its more general inclusion in normal crop

rotations, many of the early difficulties associated with linseed production are likely to be lessened. That and an assured market for the produce of 30,000 acres may well make linseed an important adjunct to the list of arable cash crops in the South Island.

Handling and Storage of Seed

It is not intended to discuss in this article the problems of growing and harvesting the crop, as those aspects were covered under the heading "The Linseed Crop" in the "Journal" for November, 1946.

On arrival at the factory each farmer's line of seed is treated individually, the first step being the drawing of a representative sample by the port grader, who divides his sample into four lots which are distributed as follows:—

1. To the Seed-testing Station, Palmerston North, where it is tested for purity, germination, and weight per 1000 seeds. On this test premiums are paid to the grower for high-quality seed.
2. To the laboratory, where it is tested for oil and moisture content.
3. To the company's Christchurch office for reference.
4. Retained in the store for reference.

The seed-storage and handling section is at present operating on a somewhat limited scale with improvised equipment, but when the installation is completed the seed will

be tipped from the trucks after sampling and elevated by bucket conveyor to a platform some 40ft. above the ground, where each line will be automatically weighed. From that point it will be possible to carry the seed to any other desired point in the storage system by modern pneumatic conveyers. These are a new development in the industry by which the seed is drawn from point to point through steel pipes by the suction force of powerful vacuum pumps.

Extremely well-dressed, clean, dry seed may be sent directly to the storage silos, but normally seed will have to pass through a preliminary dressing machine before storage. Moisture is also an important factor in the bulk storage of seed, and for safety reasons a maximum of 11 per cent. is allowed; lines which exceed that percentage will be passed through steam-heated driers which will reduce the moisture content to 9 per cent.

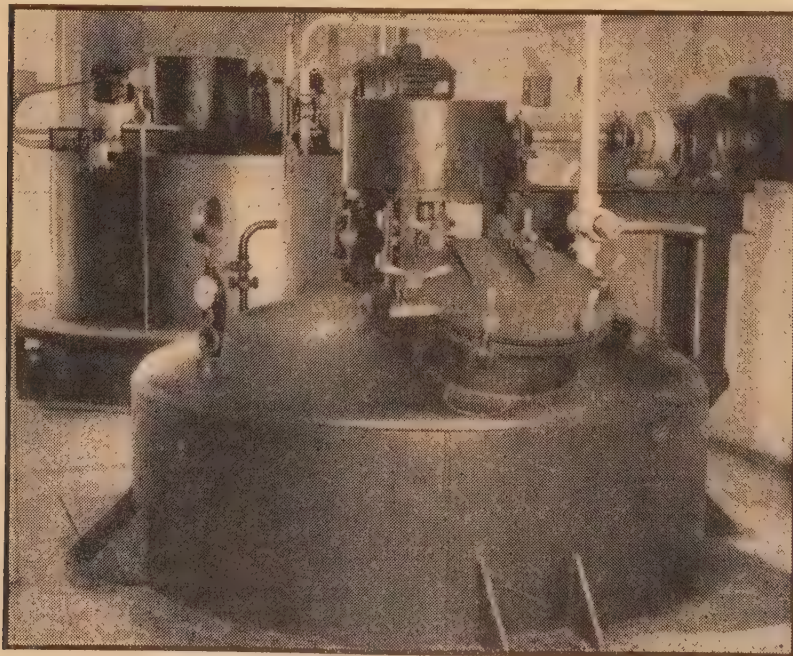
The tall, cylindrical, concrete silos, of which there are four, are an innovation in seed storage in this country. Each is designed to house 1500 tons of seed, and under the resultant pressure the seed in the lower portion of the silos would be likely to settle, but to avoid that it will be kept continuously in motion. In addition it is intended to fill only three of the silos and periodically to transfer the seed from one to another by the pneumatic conveyers.

Processing the Seed

As it is required for processing, seed will be drawn from storage, machine dressed and dried to the desired purity and moisture content, and conveyed to concrete holding bins of sufficient capacity to supply the oil expellers continuously, day and night, for a week.

From that point on construction is complete and control of the seed is taken over by the expeller operators. From the holding bins seed is conveyed mechanically over an automatic weighing machine to the crushing rollers, which consist of a series of five heavy, smooth, steel cylinders each revolving in the opposite direction to the next. The seed passes through them and is converted into a fine "meal," which is slightly warmed in a steam-heated conveyer en route to the expeller kettles, where it is cooked at a temperature of 180 to 220 degrees F. for about 20 minutes.

The cooking process is a most exacting one designed to bring about chemical and physiochemical changes in the "meal." Those changes induce the coagulation of the proteins and coalescence of the oil cells and make the "meal" permeable to the flow of oil, thus enabling the maximum yield of oil to be obtained when the "meal" is pressed.



Portion of the refinery, showing the neutraliser and drier.

LINSEED OIL PRODUCTION

Passing automatically into the expellers after being cooked, the "meal" is subjected to a pressure of 15,000 to 20,000lb. a square inch. This enormous pressure is built up by a worm shaft rotating continuously within a barrel-like cage and is controlled by a conical orifice which regulates the discharge of caked residue. The cage is so constructed that the oil when pressed from the meal permeates its walls. The expeller unit consists of a line of six such expellers working independently, and the aggregation of oil is delivered to large settling tanks by a spiral conveyor under the machines. A second, similar conveyer carries the cake residue to holding bins.

Treatment and Refining of Oil

After settling in the tanks the oil is pumped through a filter press to remove small fragments of seed and other impurities which did not settle out in the tanks. The resultant clear oil is then sampled for laboratory test and weighed before delivery to one of the four 30,000-gallon maturing tanks. After maturing it may be refiltered, drummed, and made available to the consumer as raw linseed oil or it may pass to the refinery for further processing.

All raw linseed oil contains a number of harmless compounds and odoriferous substances, as well as free

fatty acids, mucilaginous materials, and phosphatides, which it is impossible to remove by physical filtering processes. Makers of paint, printing ink, and other materials require a proportion of highly-refined oils from which certain of these substances have been removed, so the Dunedin factory is equipped with an up-to-date refining plant where the oil is chemically treated to meet consumers' requirements.

The raw oil may be treated with caustic soda and subsequently washed, dried, and refiltered to produce what is known as alkali refined oil. That is used chiefly in the manufacture of varnishes, enamels, and printing inks, where the heat used in processing would cause undue coloration of ordinary raw oil. By a somewhat similar process, using acid as the refining agent, an oil with special characteristics suited to the manufacture of white paint is obtained.

Boiled Oil

Oil boiling is also carried out in the refinery, where batches of five tons are treated at a time. The oil is heated to about 130 degrees C. to facilitate the addition of metallic driers and the introduction of air by blowing and agitation. The resultant so-called boiled oil is of thicker consistency and because of its quick-drying properties is used principally as a drying agent by paint manufacturers. Double-boiled oil is obtained by a repetition of this process and, being a stronger drying oil, is used chiefly for waterproofing. Pale boiled oil, which has similar drying properties to boiled oil but, as its name implies, is much paler in colour, is also produced for use in the manufacture of white paint.



Some of the storage tanks for refined oil.

Linseed Cake and Meal

The baked residue from the oil expellers passes from the bins through special screening and grinding machines and is bagged ready for distribution as either fine linseed meal or coarser kibbled nuts. The fine meal is used in the preparation of many concentrated stock food mixtures and the kibbled nuts are widely used by farmers in conjunction with other supplementary foods. The high protein content and general nutritional value of these by-products of the oil industry have long been recognised and the production of adequate quantities in New Zealand should prove most advantageous to the primary producer.

Laboratory Tests

From the time the seed leaves the trucks until the finished product is dispatched the strictest analytical standards are adhered to, and a modern, well-equipped laboratory staffed by qualified chemists is available to carry out all the tests necessary for the production of the highest-grade article. The seed is tested for purity, moisture content, oil content, acid number, saponification value, and iodine number. The raw oil and by-products are checked chemically and rigorous analytical tests are constantly made throughout the refining processes.

New Zealand is now equipped with an industry capable of producing her total requirements of linseed products, which are essential to both primary and secondary industries, and in addition arable farmers in the South Island are assured of a sound market for the produce of their linseed crops.



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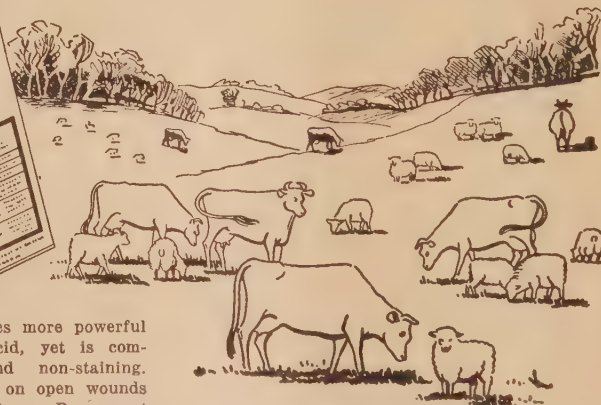
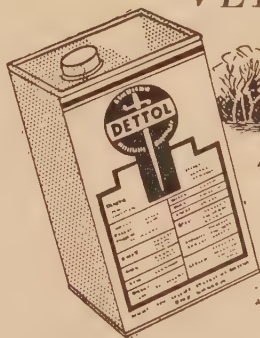
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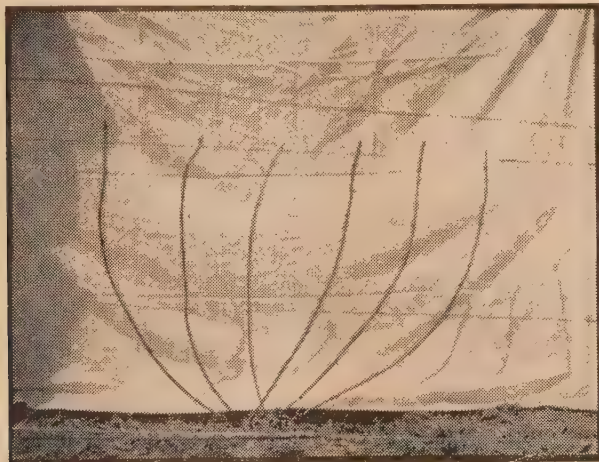
Boysenberry Culture in Nelson Central

BERRY fruits of all kinds are in good demand throughout New Zealand. Boysenberries can be produced economically on selected sites in the Moutere Hills area of Nelson as a profitable sideline, providing a means of diversifying the type of production normally carried on, which is based essentially on pip fruit growing. In this article D. J. Hogg, Orchard Instructor, Mapua, describes cultural methods for boysenberries.

THE boysenberry was named in honour of Rudolph Boysen, who is said to have developed it by crossing the loganberry, blackberry, and raspberry, but probably the exact origin of the variety is not known definitely. The berry has been classified botanically by Dr. L. H. Bailey as *Rubus ursinus*, var. *loganobaccus*.

Plants and Planting

It is desirable that plants be obtained from a reliable nurseryman. They should be one year old, free from disease, well developed and well rooted, and have been



A one-year-old plant tied to the second wire.

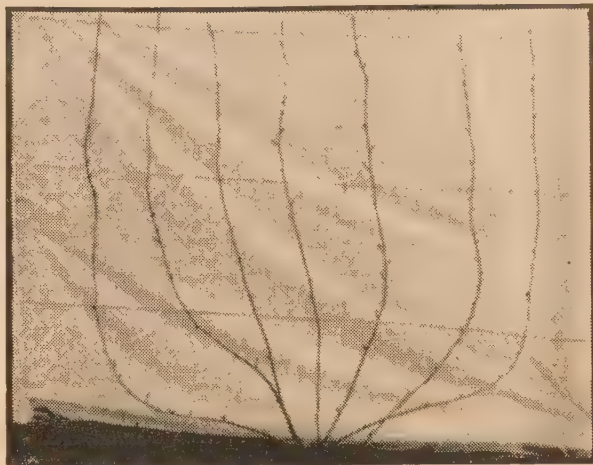
taken from plants that bear heavy, regular yields. They should be planted in the early spring and the soil should be of good quality, friable and well drained, and before planting should be thoroughly and deeply cultivated.

If possible the rows should be planted in a north and south direction to ensure that the maximum of sunshine is available for ripening the fruit. The plants should be set not less than 8ft. apart in both directions and should be planted deeply to avoid the cutting of roots during cultivation. No fertiliser should be used at the time of planting.

Propagation

Boysenberries may be propagated by a number of different methods, including layering, root cuttings, and tip layers. The tip layer method is the one usually used by commercial growers and may be carried out by burying the tips of the current season's vines in the late summer or autumn when growing is finished. The tips should be rooted and ready for cutting from the main vines in the following spring. They can then be lifted and placed in a nursery row for one year or in their permanent positions.

If the layering method is used the whole cane should be laid in a shallow trench and covered with soil in the



A plant tied to the top wire in its second year.

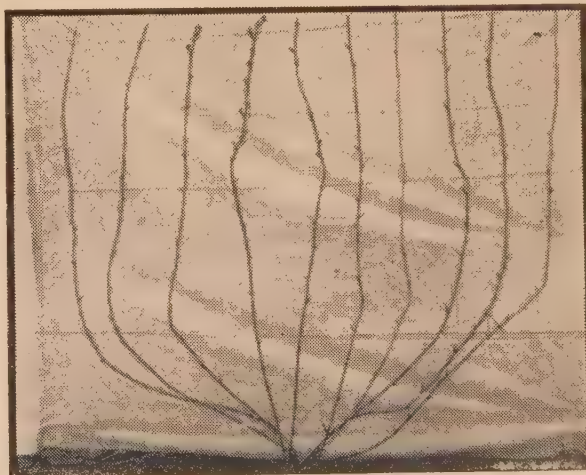
early autumn. Roots will form at the nodes along the whole length of the vine, which should be lifted in the following spring and cut into short lengths between the roots.

Plants can also be obtained from root cuttings by cutting the roots into pieces 3 to 4in. long and burying them 3 to 4in. deep in trenches.

Supporting Fence

Because of the trailing habit of growth it is necessary to provide some form of support for the vines, and a three-wire fence along the rows is recommended. Concrete posts are very suitable, as they do not harbour disease and are permanent.

The posts should be spaced 16ft. apart, starting the rows with the first strainer post 4ft. from the first plant. Anchor blocks, which may also be of concrete, should be used at the end of the rows. Should concrete be used for posts and anchor blocks the dimensions should be: Strainer posts, 8ft. 6in. long, 8in. x 4in. at the bottom tapering to 4in. x 4in. at the top; other posts, 7ft. 6in. long and 4in. x 4in. throughout; anchor blocks for strainers, 18in. x 8in. x 3in. The posts should be sunk 3ft. in the ground.



A plant tied to the top wire in its third and subsequent years.

CULTURE OF BOYSENBERRIES



A well-cared-for boysenberry garden with concrete posts.

Tying and Care of Vines

The vines should be allowed to grow on the ground during the first summer, and in the winter six of the best-developed vines should be selected, tied fanwise to the second wire, and pruned back to that point, as the rooting system is not sufficiently developed to carry longer vines and at the same time produce large berries. In the second year the number of vines should be increased according to the strength of the plant, usually to about seven, and these should be tied to the top wire in the same way. For the third and subsequent years ten vines should be used.

When harvesting has been completed all old vines which have borne fruit should be cut off close to the ground and burned. Young growth which will come away at the base of the plant during the spring and early summer must be cut out regularly until early December or it will rob the plant and affect the sizing of the fruit. After December this young growth is allowed to grow to provide the vines for the following season's crop.

The vines are best tied to the wires with a continuous length of twine to keep them well spaced and minimise damage by winds.

Fertilisers

The amount of fertiliser used should be determined by the quality of the soil and should vary from 1 to 4lb. a plant. A good mixture to use is two parts of superphosphate, one part of sulphate of potash, and one part of blood and bone. This should be applied after planting and as an annual dressing by broadcasting it within a

circle of a few feet from the stem of the plant. After the first year half the normal amount of fertiliser should be applied in the early spring and the other half soon after the crop has been harvested.

Harvesting the Fruit

The boysenberry is similar to the loganberry except that the average fruit is a little larger and darker in colour. The berries are very large, dark purple to black, and juicy, with a rather tart, pleasing flavour. They must be completely ripe to be at their highest quality. They ripen over a relatively-long period, the normal harvesting season extending from the last week of December to the end of January. During that period they

must be picked fairly frequently to harvest them as soon as they are ripe and before they decay.

Small birds are responsible for considerable damage in the gardens and in most cases some form of bird scarer is necessary. Shooting and poisoning are other methods of reducing the nuisance.

Dessert berries are usually picked in 1lb. chips or pottles and jam berries in half petrol tins containing 12lb. The chips are transported to markets in crates containing from 12 to 16 chips each.

Spraying Programme

The main diseases and pests affecting boysenberries are raspberry bud moth, blister mite, leaf roller, cane spot, and cane wilt. The spray programme recommended for their control is as follows: In winter, lime sulphur 1:15; at the green tip stage, Bordeaux mixture, 5:4:50, plus lead arsenate, 2lb.:100 gallons; thereafter, lead arsenate, 2lb.:100 gallons, every 21 days up to mid-December.

High pressure should not be used in spraying boysenberries, as the flower shoots are very tender and are easily blown off. As the space between the rows is very limited, particularly toward the end of the spraying period, a rod only 18in. long should be used.

In dry localities the vines should be well irrigated during the ripening period, but the use of a sprinkler system is not recommended, as it may cause mildew on the fruit.

Practically all the boysenberries grown in the Nelson central district are disposed of in Nelson, either to merchants or to retail shops. They are used extensively for dessert and are excellent for bottling, jam, and jelly.



A boysenberry garden in the Mahana (Nelson) area.

Small Seeds and Cereal Cropping on a Wairarapa Farm

By W. V. HADFIELD, *Instructor in Agriculture, Masterton.**

THOUGH a wide range of farming activity is characteristic of the Wairarapa, the district must be regarded as primarily suited to hill-country pastoral farming, with the raising of Romney sheep and beef cattle predominating. However, on some of the better-class soils grain crops and small seeds are grown in conjunction with the raising of fat lambs. This class of production is confined mainly to the medium-class country throughout the plains area, though to a less extent it is also practised on the heavier dairying land and on the rolling ploughable country adjoining the plains. This article describes the management of a mixed cropping and fat lamb farm in Masterton County.

STATISTICS for 1945-46 show a total of 5688 acres under cereals and crops for threshing in the Wairarapa, most of it on the plains land of Masterton, Wairarapa South, and Featherston Counties. During the past few years the areas of peas and of oats harvested for seed have increased considerably while the acreage of wheat has declined. In the same season green fodder and root crops, mostly rape, chou moellier, turnips,

* The author of this article is now serving with the occupation forces in Japan.



The farm yard and outbuildings.

and swedes, were grown on about 14,000 acres.

The small seed harvest has come into prominence in the Wairarapa in recent years and considerable areas of ryegrass, white clover, and red clover are harvested each year; several areas of cocksfoot have also given good yields. The importance of certification to the seed grower is shown by the increasing areas entered for certification each year. For 1947-48 the figures are:—

	acres
White clover	369
Montgomery red clover	376
Cowgrass	116
Perennial ryegrass	314
Short-rotation ryegrass	57
Italian ryegrass	19
Cocksfoot	40

In addition, last season about 8300 bushels of ryegrass seed was passed as Government Certified perennial seed; 6500lb. of white clover seed was accepted as permanent pasture seed and 5500lb. as Mother seed.

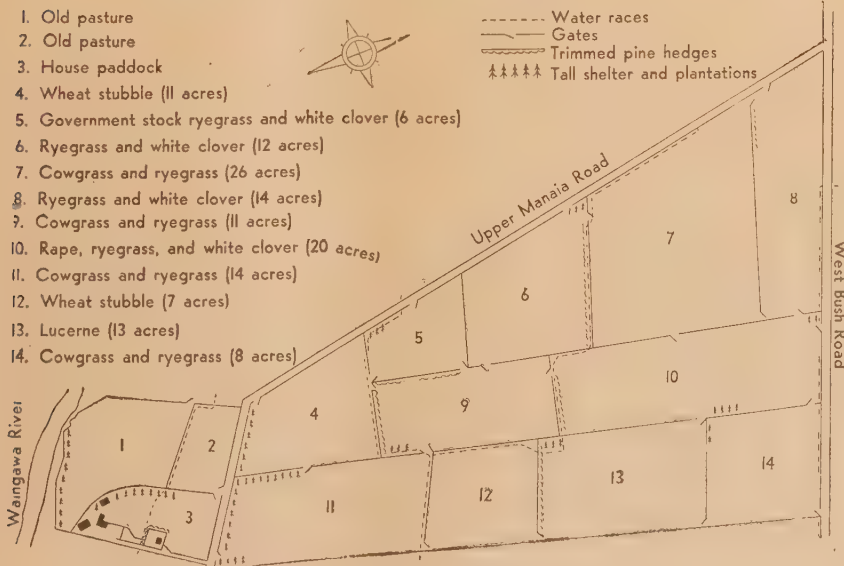
Specialised Management

Three miles west of Masterton is a 171-acre mixed cropping farm operated by Mr. G. F. Candy. As it is rather specialised, the management of this farm cannot be classed as typical of that of the majority of such farms in the Wairarapa. Small seeds and cereal crops take first place, and stock are carried primarily to control pastures in the interests of seed production. Nevertheless, stock carried on this property provide a very handsome income.

The soil type is classified as a Takapau silt loam containing 6in. of dark grey-brown silt loam over 6in. of grey-buff silt loam over stony gravel. The soil structure is typical of the main cropping area of the Wairarapa plains, though in this locality the soil is of higher fertility than in much of the surrounding country. The presence of shingle in the subsoil allows for free drainage, though the country tends to dry out during the summer. Rainfall varies from 35 to 40in. a year. December, January, and February are usually dry months, with the weather breaking in March. Such a climate suits the production of small seeds and grain crops, though the harvesting of red clover seed is made difficult if the season is late or the autumn rains are early.

With small seeds and grain crops claiming first place in the farm programme, it is necessary to reduce stock numbers to a minimum during the spring and summer, when most of the grassland is closed for seed production. Store lambs are bought during January for fattening on rape, 25 to 30

PLAN OF THE FARM



SMALL SEEDS AND CEREALS IN THE WAIRARAPA



Shelter consists of single rows of *Pinus radiata* 4ft. apart, trimmed and topped to 8ft. each year, giving good, close ground shelter.

acres of which are grown each year for that purpose. Cull hoggets are carried through the winter and sold in October before the closing of pastures for seed.

Wheat, peas, and oats are the main cereal crops grown, and each year perennial ryegrass, white clover, and red clover seeds are harvested from about half the farm.

Water Supply and Shelter

Each paddock on the farm can be watered by subsidiary drains which lead off from the main water race. These are shown in detail on the farm plan on the previous page.

When Mr. Candy took over the property 11 years ago he planned a shelter system from which he is now reaping the benefit. Shelter consists of single rows of pines 4ft. apart and fenced off 4ft. 6in. from the trees on either side. They are trimmed and topped to a height of 8ft. each year, and in all cases this treatment has resulted in good, close ground shelter.

Cropping Programme

Wheat and peas are the main cereal crops grown, though some very

high yields of oats have been recorded in the past. In addition 50 to 100 acres of grass and clover seed are harvested each year and 25 to 30 acres of rape and new grass are sown annually. After three consecutive seed crops have been taken, seed-producing areas are ploughed up in the fourth year and usually sown in spring wheat. The types of cropping rotation favoured are:—

Old grass—spring-sown wheat—autumn-sown wheat—peas—rape and grass seed.

Old grass—spring-sown wheat—autumn-sown wheat—perennial ryegrass and white clover.

When red clover is to be sown after a crop of peas it is usual to sow a

catch crop of barley for greenfeed, followed by the spring-sown rape, perennial ryegrass, and red clover.

The cropping programme and crop yields over a three-year period are given in the table on this page and they show that the growing of small seeds is an uncertain venture. The yields of grain crops are fairly stable, but the yields from grass and clover crops fluctuate markedly from year to year. Mr. Candy has had some excellent yields, but he is the first to admit that he has had some very disappointing seasons. For that reason a good variety of crops is grown to spread the risk.

Wheat and Peas

Cross 7 wheat is usually sown as both spring and autumn wheat, drilled at the rate of 2 bushels to the acre. Spring wheat is sown in August-September and is the first crop after grass; autumn wheat is sown before the middle of June and usually follows spring wheat in the rotation. Wheat is direct headed, usually during January, and the stubble is ploughed in rather than burnt. The average yield of wheat on this property is

AREAS SOWN AND AVERAGE YIELDS OF DRESSED SEED PER ACRE

CROP	1944-45		1945-46		1946-47	
	Area (acres)	Yield per acre	Area (acres)	Yield per acre	Area (acres)	Yield per acre
Wheat	26	40 bushels	7	55 bushels	18	42 bushels
Peas	20	65 bushels				
	26	34 bushels	20	25 bushels	Not grown	
Oats	12	95 bushels	Not grown		Not grown	
Black skinless barley	Not grown		6	40 bushels	13	50 bushels
Rape and cow-grass	19		26		20	
	13	10 bushels of ryegrass, 68lb. of white clover	12	7 bushels of ryegrass, 50lb. of white clover	32	Dressed weights not to hand
Perennial ryegrass and white clover	14	16 bushels of ryegrass, 22lb. of white clover	14	8 bushels of ryegrass, 177lb. of white clover		
			11	25 bushels of ryegrass		
Red clover	14	343lb.	Nil (drought season)		59	
	11	364lb.				

about 55 bushels an acre. In the past two years Government Certified Cross 7 wheat has been sown for seed.

Garden peas of the William Massey and Greenfeast varieties are sown in October at the rate of $3\frac{1}{2}$ bushels an acre. The crop is cut when dead ripe and threshed from the swath by a pick-up header, which follows the mower closely. This practice is adopted extensively in the Wairarapa because of the risk of wind damage when the crop is cut earlier and allowed to mature in the windrow. When the pea crop is not too heavy swath boards are attached to the mower, one on the inside of the knife bar and one on the outside; they have the effect of concentrating the 5ft. mower cut into a 3ft. row, which greatly facilitates the picking up of the crop during harvesting. Average yields are between 30 and 35 bushels an acre.

Grass and Clover Seed

Certification plays an important role in seed production on this farm. Mr. Candy sows only high-grade Government Certified seed on all areas he intends using for seed crops.

A fairly-rigorous ploughing-up programme is adopted each year, and as soon as seed-producing areas show signs of running out they are ploughed up and again take their place in the rotation of crops. Consequently, pastures are ploughed up when useful feed is still available, though they do not give maximum seed yields.

The seeding rate for perennial ryegrass and white clover crops is 30lb. of Certified Pedigree perennial ryegrass and 2lb. of Certified Mother or Pedigree white clover. That is sown by March 15 and usually follows a crop of oats. If conditions are suitable perennial ryegrass may be harvested in the first and second years, but in the third year the stand usually becomes infested with goose grass and management is concentrated on the harvesting of white clover seed.

The perennial ryegrass and white clover crop is cut with a mower with

HARVESTING GRASS AND CLOVER SEED



Direct heading a crop of cowgrass seed.

swath board attachment and allowed to lie in the swath for seven to ten days until mature. The crop is then picked up and threshed with a header harvester. The straw is usually baled if a first or second harvest is being taken, though the aftermath from the third crop is not saved but is ploughed in for the benefit of the succeeding crop. An effort is made each year to harvest white clover and perennial ryegrass seed together from the same area. Seasonal conditions dictate whether the crop is treated mainly as a perennial ryegrass or a white clover area. One season, for instance, two areas were closed in October for perennial ryegrass seed, but the season proved excellent for white clover and the areas subsequently were left for clover seed, though some perennial ryegrass seed was collected with it.

Cowgrass seed is sown at the rate of 8lb. an acre with 30lb. of perennial ryegrass and 2lb. of white clover seed. This seed mixture is sown in November with 2lb. of rape seed an acre. The rape crop is fed off during the summer and autumn and the area closed in September for an early hay crop. Yields of hay have averaged 3 tons an acre with this management. The hay crop is removed by late November and the area then closed for cowgrass seed production. By March the crop is ready for harvesting. If growth is upright and the seed heads have ripened evenly, the crop is usually direct headed, but in seasons when too much bulk and consequent unevenness of ripening is evident the crop is cut with a mower and picked up with a header. Mr.



A fine field of cowgrass. This crop is gaining favour in the Wairarapa.

FARMING ON THE WAIRARAPA PLAINS



The modern homestead in an attractive setting.

Candy prefers to direct head the standing crop where conditions are suitable. Yields of 1 to 1½ bags of dressed seed to the acre have been averaged.

In recent years the growing of Montgomery red clover for seed has increased in popularity throughout the Wairarapa. However, Mr. Candy has not been tempted to change to this more permanent strain, as for some years now this property has produced only cowgrass seed. The contamination of the two strains likely to occur if Montgomery red clover seed were to be sown would undoubtedly cause rejection from seed certification. Since its release Government Certified cowgrass seed has been sown in preference to uncertified seed, and Mr. Candy hopes to sow only the Certified seed in future.

Two consecutive crops of seed are taken off areas on this country, and in some years a third crop has been harvested before the paddock has finally run out.

Topdressing Programme

All grass paddocks are topdressed with superphosphate in August. Before the war when fertiliser was available in quantity it was usual to apply it at the rate of 3cwt. an acre.

All areas receive an application of 1 ton of lime an acre in the spring after sowing down. The owner maintains that better results are obtained when lime is distributed on the sward than when it is worked in with the cultivation equipment before sowing.

Cultivation

Grass paddocks for spring-sown wheat are ploughed by early June to a depth of 5in. Skim ploughing is not necessary, as the turf is not usually very thick on the three-year-old grass stands. To form a suitable seed-bed the area is disced early in the spring and worked down with tines and chain

harrows for September sowings. The crop is harrowed after being sown.

Ground for autumn-sown wheat is ploughed as soon as possible after the previous crop has been harvested. After being ploughed the ground is worked with the cultivator and tine harrows, leaving a more rubbly surface than is required for spring-sown wheat. That is desirable, as autumn-sown wheat is fed off once during the spring and then harrowed with chains and tripods. The rubbly surface left after sowing allows this operation to proceed to the best advantage.

Ground for autumn-sown grass is ploughed out of oats or peas as early in autumn as possible. After a discing, two tine harrowings, and a rolling, the seed-bed is ready to be sown. Seed is broadcast through a drill and is followed up with a brush harrowing and a rolling. Ground for spring-sown grass and rape seed is ploughed early in the winter and allowed to weather in the furrow until October, when the ground is worked down for late-October or early-November sowing.

Implements and Equipment

In addition to his own work, Mr. Candy and his two permanent employees do considerable contract work in the neighbourhood, for which Mr. Candy has a full range of agricultural, cultivation, and harvesting equipment—two wheeled tractors of medium horsepower, pick-up baler, header harvester with 6ft. cut, reaper binder with swath attachment, power mower with 5ft. cut, three-furrow plough, tandem discs, cultivator, heavy tine harrows, chain and tripod harrows, roller, drill, topdresser, hay sweep, hay tedder, and trailer.

The following is the harvesting work Mr. Candy completed last season, including his own cropping work:—

20,000 bales of hay pressed.

92 acres of ryegrass and white clover harvested.

57 acres of wheat.

25 acres of barley.

10 acres of oats.

8 acres of peas.

150 acres of red clover was also closed for seed.

During the winter considerable cultivation work in the district is also undertaken by Mr. Candy and his team.

Stock Programme

No breeding stock are run on this property. Each year about 1000 black-faced store lambs are bought during January for fattening on the 25 to 30 acres of rape and are sold off the property as fats before the end of May.

During March 600 to 700 cull ewe hoggets and a few wethers are bought in, carried through the winter, and sold in October before the farm is closed up for seed production. These ewe hoggets are bought each year from the same source, which has proved reliable. On an average, 35 to 40 lambs are fattened annually on each acre of rape, and during the winter seven ewe hoggets are carried to the acre.

Careful Planning Needed

Though this farm is not typical of the majority of the arable farms of the Wairarapa plains, its management demonstrates the possibilities of this class of country. The farming of small seeds offers great promise to the man who ventures into this branch of farming, but he must be prepared for setbacks caused by the irregularity of the seasons. That calls for careful planning, not only to minimise the risk of crop losses through adverse conditions, but also to have as a stable background some steady and reliable source of farming income on which to lean during adverse seasons. Mr. Candy has overcome that obstacle to some extent by growing a wide range of cereal and grass seed crops and possessing the equipment necessary to harvest them efficiently. His stock programme is fluid in that he can increase the numbers of stock carried in the event of a crop failure.

With improved equipment now available and a greater knowledge of the management of grass and clover seed crops, the farmer is becoming more and more proficient in the saving of small seeds. The growing of grass and clover seed crops is doubly beneficial in that fertility is built up and carrying capacity raised as a result of the use of high-producing strains of seed. Nevertheless, the term "catch crop" applies to this aspect of farming just as much today as in the past.

Good and Bad Habits in the Milking Shed

By W. G. WHITTLESTON, *Physical Chemist, Animal Research Station, Ruakura.*

THE achievement of efficiency in the machine-milking dairy is essentially a problem in the forming of good habits. The cow was not intended by Nature to be milked twice a day, nor was she intended for the large-scale production of milk. The natural cow, like any other natural mother, produced milk as food for her young. The calf had no set meal hours; as soon as the urge arose it would suckle its mother. Thus it might be expected that the mechanism in the cow would be intended to let some milk down from time to time when the calf supplied the necessary stimulus. That mechanism would need to cause only enough milk to flow for a feed for the calf.

IN other words, under natural conditions the cow was expected to eject her milk in small amounts quite frequently. Contrast that with man's requirements: He expects to be able to get all the milk a cow can secrete by milking her twice a day. It is surprising that results are as good as they are—the cow must indeed be a very "elastic" animal.

The Let-down Mechanism

To understand the importance of habit formation, it is worth considering the mechanism by which the cow lets down her milk.

The milk is secreted into little units somewhat like bunches of grapes connected by tiny tubes. The very small tubes connect to larger ones, and so on, until finally all come to the large ducts opening into the milk cistern. Most of the milk in the udder is held in the little grape-bunch units (the grapes are called alveoli) and the very fine tubes.

Just as water will not flow of itself from a sponge, so milk will not flow

spontaneously from the secreting tissue in the udder; something must squeeze it out. Nature has provided the squeezing mechanism in the form of tiny muscle fibres forming networks round the alveoli and along the fine tubes. When those fibres contract, the milk is squeezed down into the large ducts and milk cistern.

Unlike the muscles controlling the cow's movements, the squeezing muscles in the udder are not controlled by nerves directly, nor can the cow exercise any voluntary control over their action. In other words, a cow cannot decide to be hasty and "hold her milk" at will. The squeezing muscles are made to act by a substance secreted into the blood stream by a small gland at the base of the brain—the pituitary gland. This gland receives messages from the central nervous system and as a result secretes the "let-down" substance, which takes about three-quarters of a minute to reach the udder. These stimulating messages normally arrive as a result of the teats and udder being stimulated—that is, the natural stimulus

causing the letting down of milk is the sucking of the teats and the bunting of the udder by the hungry calf.

The situation is normally more complex than this simple picture. Even under natural conditions the cow sees the calf every time she is suckled, and soon the sight of a hungry calf would cause the milk let-down reflex to work.

Shed Procedures as Stimulus

In the modern milking shed the basic stimulus to let-down is the squeezing action of the pulsator. However, the leg-roping, washing, and other shed procedures are always associated with milking and become just as effective as the pulsator in causing milk let-down in the well-run shed. But that raises an important point: The "conditioning" of a cow to let her milk down to the preliminaries to milking depends on shed regularity. Anything which upsets the shed routine will reduce the effectiveness of the let-down or stop it altogether. If a cow is trained in a well-run shed, her milk will always be down when the cups go on. That is the most desirable way to train the cow, as no time is lost in getting the milk away.

However, the pituitary substance causing the milk to be let down is destroyed in the blood. If the cow is stimulated to let her milk down too long before the cups go on, the efficiency of the muscles in the udder will be reduced and milking may be incomplete. The cups should go on within one minute of the stimulus which is effective in causing the milk to come down.



[National Publicity Studios photo]

HABITS IN THE MILKING SHED . . .

A frightened cow gives little milk, because when an animal is frightened a substance (adrenalin) is secreted into the blood which prepares it for action—fight or flight. Unnecessary organs are put out of action by this substance, and these include the udder. Thus when a cow is frightened the let-down mechanism does not operate. The most effective way to make a cow stop milking is to frighten her; bad dogs or an angry milker are equally effective.

Stripping Problems

The problem of hand stripping can be divided into two aspects.

First, after a cow has been machine milked there often remains a small amount of milk which can be obtained by hand. A gentle pull on the cups for a few pulsations will usually remove this residue. The reason for this sort of incomplete milking is probably that the cups crawl up the teats as the udder empties and cause the top of the space within the teat to close off. Simply pulling down on the claw will remove any milk withheld by this cause. Experiments at the Animal Research Station, Ruakura, suggest that the amount of strippings held because of cup-crawling is small with most cows and negligible with many.

The second kind of stripping is more difficult to deal with and more interesting to the investigator. Many farmers say that in their worst strippers there seems to be a "second flow" of milk after hand stripping has been started. Investigations at Ruakura throw some light on the problem of the bad stripper, but one point should be made: The cow is intended by Nature to give milk little and often, so it is not surprising that after the mild stimulation of putting on the machine there is a second secretion of let-down substance when the hand stripping stimulus is applied. In other words, an unsophisticated, natural cow would tend to be a stripper.

Results of Experiments

Investigations at Ruakura have shown:—

1. If two quarters are machine milked normally and the other two quarters after a wait, the yield from the second quarters declines. That confirms a well-known fact—that slow milking causes loss in yield because the let-down substance is partly destroyed in the cow's blood.

2. If the cow is stimulated by squeezing her teats and massaging her udder before the second milking, production from the second pair of quarters does not decline.

3. If a cow is properly stimulated, milked normally, left a while, and the cups reapplied after stimulation, little or no milk is obtained.

4. If a cow is inhibited by some marked stimulus, milk yield and milking rate decline, and when the cups are put on a second time after stimulation a second rapid flow of milk is obtained.

5. The amount and rate of milking when the cups go on the second time becomes greater as the inhibiting stimulus increases.

Under such treatment one quite good milking cow was made into a slow starter which gave a second flow on occasion without a second stimulus.

The experiments suggest that the really strippy cow is one which does not let down her milk to the machine with maximum efficiency. Hence when she is hand stripped the second and more effective stimulation causes a further flow of pituitary substance and a further let-down of milk. It is possible that the cow is faulty sometimes, but more likely that the farmer does not give the cow an adequate stimulation at the start.

A good starting procedure is:—

Wash the udder thoroughly with a fairly vigorous action.

Take a squirt from all teats into a strip cup; this is a check on mastitis and a good additional stimulus.

Put the cups on.

Basis of Success

The basis of successful machine milking is regularity, uniformity, and the avoidance of anything disturbing or frightening. The man who darts about the shed making a show of efficiency and a great clatter will not be a good milker. Cows are not impressed by speed. The bovine idea of efficiency is a man who moves about unobtrusively, always doing the right thing at the right time, never hustled or bad-tempered, treating his animals as pets to be handled sympathetically and not kicked when anything goes wrong. Such a man will be rewarded by more milk, less work, and shorter hours in the shed.

The same efficient milker will also attend regularly to his machine. The pump lubricators will be filled before each milking; the relief valve will be checked, the gauge reading right, the inflations changed regularly, and the air admission holes clear.

The most efficient man in the shed is he whose regular, systematic habits are reflected in the regular, consistently-good response of his cows. A shed routine can be built up in which no leg-ropes are required, hand stripping is eliminated, only some of the cows are machine stripped, and at least 10 cows are milked every hour by each set of cups.

Banding of Waterfowl

AS a means of determining better methods of conserving waterfowl the Wildlife Service of the Department of Internal Affairs last year sought the co-operation of the public in an investigation into the habits and problems relating to these birds by returning to the Department leg-bands placed on birds which had been live-trapped and liberated. Information obtained from last year's small-scale experimental banding, which was confined to the Manawatu district, proved very useful and as a result it is intended to carry out banding on a much wider scale this year and the public, particularly country people, are asked to give all possible help. Work in this connection will be done as follows:—

1. Mallard duck reared at the Government Game Farm at Ngongotaha and liberated in the Rotorua Acclimatisation District will be banded.

2. Provided supplies of bands arrive in time from overseas, all pheasants to be liberated from the same farm in the Rotorua district will be banded.

3. Mallard, grey, and spoonbill duck will be banded at three banding stations in the Palmerston North area.

Banded birds carry an aluminium band attached to the right leg, bearing a number and the words: "Return Wildlife Service, Govt. Bldgs., W'gton., N.Z."

All persons who find or shoot a banded bird are requested to:—

(a) Retrieve the band.

(b) Send it to the Controller, Wildlife Service, Department of Internal Affairs, Wellington, or to the nearest acclimatisation society secretary, or ranger, with a note of the following:—

1. The date.

2. The locality where the bird was shot or found.

3. The sender's name and address.

From bands returned last year it would appear that more than a third of the ducks banded were shot. This would indicate that "hunting pressure" is high and farmers, who represent a substantial proportion of regular shooters, can easily see what effect such pressure can have on the sport should it continue at the apparent rate of last year.

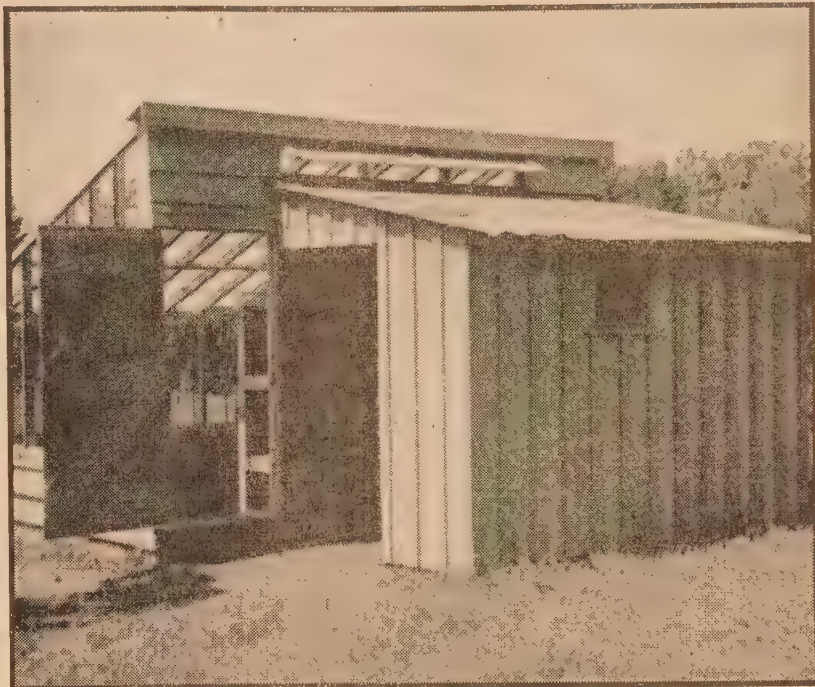
About a third of the banded grey duck taken last year were shot in the vicinity of the banding station, but some travelled up to 80 miles away within a month. One of the longest flights was of a grey duck banded on April 3 at Karere (Manawatu) and shot on May 3 at Horonui, in Hawke's Bay, about 80 miles away. All the mallards except one remained within the district where they were banded.

A Small Glasshouse for the Home Gardener

MANY a farmer or home gardener at times has wished for a small glasshouse in which to grow pot plants, raise seedlings, or grow such vegetables as tomatoes, cucumbers, beans, and lettuce for home use. In this article S. O. Gillard, Instructor in Vegetable Culture, Auckland, describes a small glasshouse of the lean-to type which will appeal to many because of its simplicity and ease of construction.

THE construction of a lean-to glasshouse is well within the capacity of many amateur carpenters, who as well as saving on the cost of building would derive much pleasure from the work and a sense of achievement when the task was completed. Apart from the necessary tools and equipment and the requisite timber, glass, and other materials, the essentials are the ability to take accurate measurements and care in construction.

The lean-to glasshouse has some advantages in that it can conveniently be built against the northern wall of an existing building or placed with its boarded side to the south and a small potting shed attached. A convenient size is 12ft. long and 10ft. wide,



Facing north, the glasshouse is well protected from cold southerly winds by high shelter.



Three tiers of shelves run along the east and south walls. Curtains provide shade for freshly-pricked-out seedlings.

with a height of 6ft. on the lower side and 8ft. 6in. on the boarded side. A house of this size would hold from four to five dozen tomato plants with a 2ft. path running along the boarded wall. If a potting shed is to be attached, the door can be anywhere along the board wall convenient for opening into the shed; otherwise the door can be placed at one end.

If the glasshouse is not to be built against an existing building, the south wall should be of wood, brick, or asbestos sheeting. Within a few inches of the top of the wall provision should be made for a wooden flap ventilator the length of the house and 9in. deep, hinged at the top to open outward. The lower 12in. of the ends and northern wall could be concrete, brick, or asbestos sheeting, as it is not necessary to have glass to ground level. Wooden flap ventilators running the full length of the house should be provided at the top of the northern wall, the width depending on the size of the glass panes. If standard 20in. x 18in. panes are being used, three panes the wide way will give a height of 53½in. (allowing a ½in. overlap), and that on top of a 12in. concrete or asbestos wall brings the height to 65½in, leaving a depth of 6½in. for the ventilators.

The exact size of the house and the spacing of the rafters will depend on

GLASSHOUSE FOR THE HOME GARDENER . . .

the size of glass used and the final dressed measurements of the timber. A standard size of glass such as 20in. x 18in. is recommended, and if used the wide way has the advantage of saving timber and reducing shading by the wider spacing of rafters. However, if the panes are used in that way the glass weight should not be less than 20oz.; glass of lighter weight should be used the narrow way.

Materials and Cost

The illustrations with this article show a glasshouse recently constructed on a plan similar to that outlined. Following is a summary of the materials used and their cost.

The glasshouse faces north, with a lean-to shed on its southern side, and has the benefit of excellent protection from cold south winds. The principal measurements are:—

Glasshouse	12ft. x 10ft.
Potting shed	9ft. x 6ft.
North wall of glasshouse	4ft. 6in. high
South wall of glasshouse	8ft. high
North wall of potting shed	7ft. high
South wall of potting shed	6ft. high

The glasshouse door, 6ft. x 2ft. 6in., is at the west end of the south wall, and the shed has an earthen floor. Glasshouse ventilation is provided by a wooden flap 6ft. long and 9in. deep above the shed roof, two wooden flaps 3ft. 6in. long 9in. deep below the glass on the north wall, and six movable

filler pieces fitting between the glass roof and the top plate of the north wall.

Inside the glasshouse are three tiers of benches or shelves for seedling boxes along the east and south walls. The eastern shelves are 6ft. long and 2ft. wide, the southern ones 7ft. 6in. long and 1ft. 6in. wide. The two lower benches on the south side are curtained to shade freshly-pricked-out seedlings or germinating seeds. The top shelves should be high—not more than 1ft. 6in. below the glass where the rafters are lowest; seedlings growing too far below their glass covering are inclined to become drawn and spindly.

Costs were:—

	£	s.	d.
Timber	26	5	0
Delivery of timber	1	19	3
Glass and cartage	11	18	0
Tarred roofing material for potting shed roof	1	2	0
Waterproof sealing	1	3	6
Paint (approximately)	5	0	0
Foundation posts	1	3	0
1 sheet of flat iron	0	16	0
4 pairs of hinges and 1 lock	0	19	4
Nails and sprigs	0	10	6
Building permit	0	5	0
1 lever for top ventilator	0	3	9
Labour, carpenter and glazier	17	16	0
Odd help in clearing, painting, etc.	7	4	0
	76	5	4

This very useful little glasshouse cost about £50 for materials, the balance being for labour, which, in many instances could be provided by the gardener or farmer himself.

Suggested Improvements

The following modifications are suggested as improvements which would add little or nothing to costs:—

1. The two flap ventilators below the glass in the north wall could be eliminated. Experience indicates that such ventilation is neither necessary nor desirable. Ventilators along the tops of the side walls are thoroughly effective and do not create undesirable draughts.

2. The lower wall of the house should be about 6ft. high to give more air space for plants and room for the owner to stand erect.

3. The ventilator along the top of the south wall should be extended to the full length of the wall.

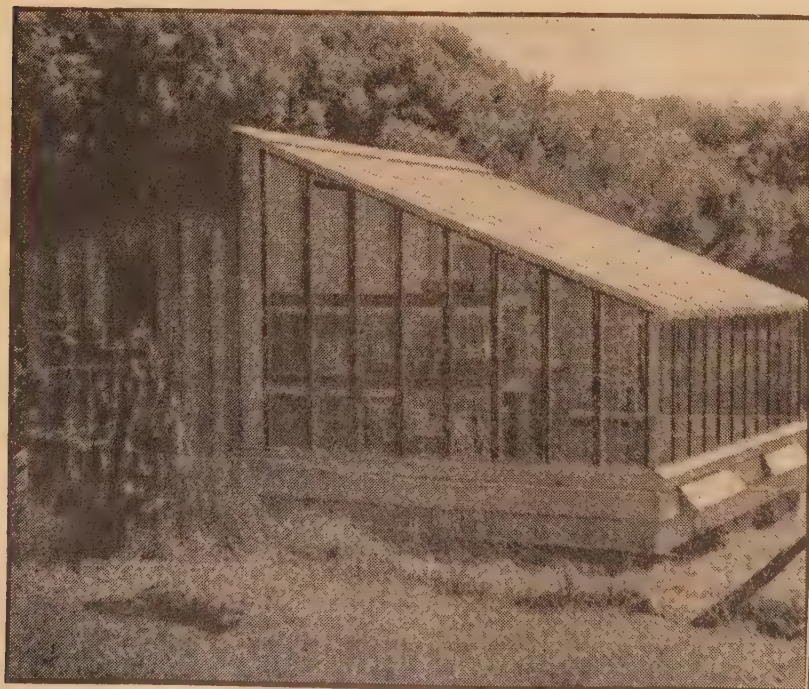
4. Glass of 20oz. weight and large dimensions—for example 20in. x 18in.—should be used if it is obtainable, and the panes should be placed the wide way to reduce the numbers of rafters and studs, saving cost and admitting more light. Wider spacing of rafters makes a surprising difference to the brightness of the house.

5. If rafters are much more than 9ft. long they should be supported by a 4in. x 2in. bearer with angle braces footed about 6ft. high along the south wall and about 3ft. apart, as shown in Fig. 1.

6. Spouting is necessary in most situations to take away rain water, which may saturate the soil in the house.

Ventilation

Fig. 1 shows suitable types of side and ridge ventilators, which should run the full length of the house. The flaps may be in one piece or in several shorter sections if that is considered more convenient. Ventilators should be weatherproof and capable of adjustment to several positions according to the demands of weather and season. Alternative positions are shown for the upper ventilators. If the roof of the potting shed is to be lower than the ridge of the glasshouse, the ventilator should be at the top of the dividing wall above the shed roof; should the glasshouse be built against a higher building or a wall in which a ventilator cannot be provided, the alternative position of the ventilator may be used. The lower position has several disadvantages, including less effective ventilation, greater difficulty in weatherproofing the flaps, and more risk of accidental breaking of the glass roof while the flaps are being opened or closed.



A back view, showing the potting shed and entrance.

The same diagram shows how roof bracing may be placed if it should be necessary. Long rafter spans tend to sag after several seasons, even if they remain straight when first erected. Fortunately, in most small lean-to houses bracing may be done later if it proves necessary. In a house with rafters which do not require supporting braces a 2in. x 1in. spacer should be nailed to the undersides of the rafters, midway between the ridge and the top of the side wall, to assist in holding the correct rafter spacing.

Regular painting of all glasshouse woodwork must not be neglected. Outside weathering tends to open up leaks between glass, putty, and wood, and condensation of moisture on woodwork inside the house will cause serious deterioration if wood surfaces are not fully and continuously protected.

Details of Construction

Rafters and wall studs which carry the glass are of 3in. x 2in. timber, dressed and rebated as shown in Fig. 2. Because dressing appreciably reduces the original 3in. x 2in. measurements, the timber must be prepared before the rafter spacings can be calculated accurately. Rafter spacings (centres), using 20in. glass, would be worked out thus:—

Glass measurement	..	..	20in.
Space between rafter rebates (usually $\frac{3}{8}$ to $\frac{1}{2}$ in.) say	..	..	$\frac{3}{8}$ in.
Clearance between glass and wood ($\frac{1}{16}$ in. each side of glass)	..	..	$\frac{1}{8}$ in.
Distance between centres of rafters	..	..	21in.

Timber to go into the ground will last longer if it is first treated with creosote. All timber above the ground should be painted with a suitable primer before construction of the house. White paint, the best light reflector, is recommended for the finishing coat.

Copper or galvanised nails must be used because plain iron nails corrode very quickly in the moist conditions inside a tomato or seedling glasshouse.

Fig. 1 shows that the 4in. x 3in. plate at the top of the lower wall is specially cut to provide a bearing surface for the ends of the rafters, which are flush with its outer edge. The top plate also has a 1in. rebate in its lower outside edge to take the hinged side of the ventilator flap. The outer surfaces of the 3in. x 2in. studs are flush with the rebated lower edge of the top plate. The spouting is of a special type with its inner edge bent to slip into saw cuts in the ends of the rafters just beneath the glass. The spouting covers the space between the glass roof and the top plate and needs

DETAILS OF CONSTRUCTION

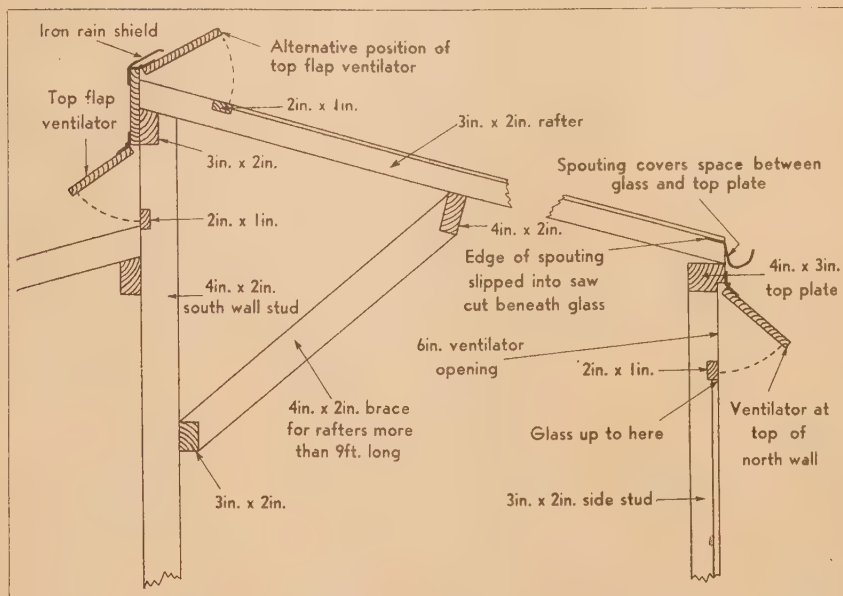


Fig. 1—A cross-section showing details of construction of the glasshouse. A potting shed can be built against the north wall.

no supporting brackets. If no spouting is used, the rafters should project 3in. beyond the top plate, the spaces should be blocked with short boards, and a drain must be provided at the foot of the wall to carry away water.

When the house is ready for glazing, putty is spread generously in the rafter rebates. The first glass pane is laid at the lower ends of the rafters and is

firmed evenly down on to the putty. The glass is held in position by brass brads partly driven into the rafters at the lower edge and midway along the sides of the sheet. The second pane is then firmed into the putty with its lower edge overlapping the top of the first sheet by $\frac{1}{4}$ in. The second sheet is held by a pair of brads driven into the rafters diagonally at the sheet's lower edge to prevent slipping, a pair just above the overlap, and a third pair midway along the edges. Succeeding panes are laid in the same way. The ends and side are glazed similarly, beginning at the bottom and working upward. An overlap of $\frac{1}{4}$ in. is sufficient and it should never exceed $\frac{1}{2}$ in., especially on the roof. Excessive overlapping of glass encourages retention of moisture between the surfaces, producing fungous growths which reduce admission of light and sometimes cause leaks.

A general plan of the glasshouse may be made in advance, but exact timber and glass measurements should be known before final details are worked out. It is easier to design the house to suit the glass measurements than to cut glass to fit a frame built without sufficient forethought.

The limitations of a small section may preclude the building of a glasshouse facing directly north, but the site chosen should expose the glazed walls of the house to the greatest possible amount of sunshine. The purpose of a glasshouse is to use to greatest advantage the warmth and light of the sun.

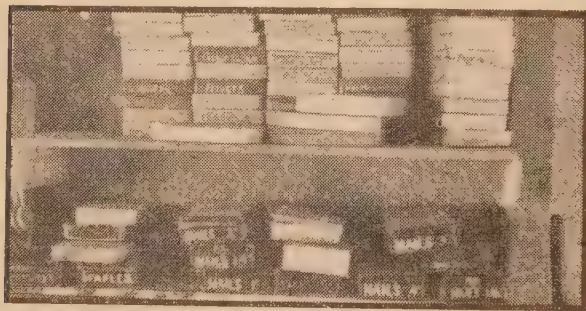


Fig. 2—Dimensions of rafters.

ORDER IN THE FARM WORKSHOP

By S. H. SAXBY, *Agrostologist, Wellington.*

EVERY farmer has a workshop. It may be a large building or just a corner of the garage, but the question "Where is it?" seems to be universal when such small items as fuse wire, tap washers, and tacks are sought. These things are frequently put away with such great care that finding them is a problem. Often all the odds and ends find a resting place in a drawer, in a box, or in a rusty biscuit tin. They may be kept separate in tobacco tins, cocoa tins, or mustard tins, or they may not be in tins at all. They may be wrapped up in scraps of paper, or they may be loose. A tap washer rubs shoulders with a staple, and the few remaining harness rivets are at the far end of the drawer from their washers. Whenever something is wanted there is a frantic burrowing among tins, papers, and loose bits and pieces, the only result often being a broken finger nail and a worse temper.

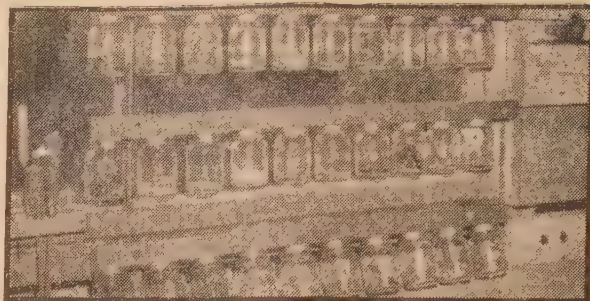


Though labelled tins are useful for holding small articles, they have many disadvantages, the chief of which are their instability when stacked high and the fact that the quantity of the contents cannot be seen.

SOME people improve on this lack of arrangement by keeping, or trying to keep, the tins neatly stacked on shelves, each tin with the name of the contents painted on the outside. Though that is certainly a great improvement, it has some drawbacks. When the stack of tins becomes fairly high accidents are not uncommon, and picking up a shower of small items is a tedious job. Sometimes the owner hopefully opens a tin marked "screws, brass, $\frac{3}{4}$ in.," only to find that the bootmaker's tangles have found a home there instead. A further search discloses that the "screws, brass, $\frac{3}{4}$ in.," are in the tin marked "bif. rivs."

Odds and ends can be kept separate, kept tidy, and kept in view by storing them in screw-top jars, the metal tops of which are screwed to the undersides of the shelves. The advantages are obvious. The jars may be in single rows, or they may be in staggered double rows. They may hang straight down, or the shelving may be tilted to let them hang at an angle.

The size of the jars used varies with the nature of the articles to be kept in them. For most small articles the 4oz. jar has been found very useful; it is about 3in. deep and 2in. wide. When arranging the layout of the jars ample knuckle room should be provided all round them, particularly if they are likely to be in frequent use. For ease of handling the clearance should be at least 1in. all round and not less than $2\frac{1}{2}$ in. below each jar.



Jars may be used to advantage by placing them against a window so that the contents may be recognised easily.

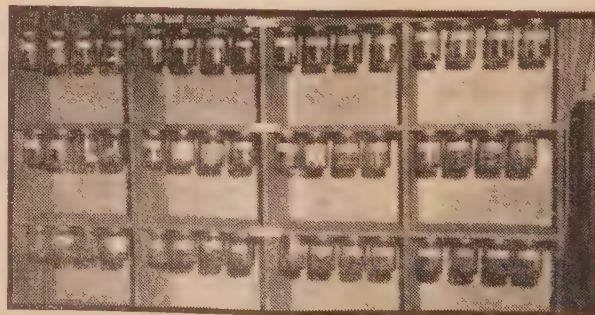
Attaching the Lids

Screws and not nails should be used to hold the lids to the shelving. Nails have a relatively-small bearing surface and are likely to work loose. Five-eighth-inch seven-gauge, round-headed screws have been found very satisfactory. The comparatively-heavy gauge is desirable because of the large bearing surface that it provides, and washers provide added security. Round-headed screws should be used in preference to those with countersunk heads, which have only a very small useful bearing surface.

Holes in the lids can be either punched or drilled. If the shelving is of soft wood, punching is satisfactory, as the "burr" resulting from the punching helps to grip the wood. The holes should be made well away from the edge of the lid to prevent the top of the jar from being splintered as the result of being tightened against the screw heads.

The jars can be labelled if desired, preferably on the inside, as an outside label collects dirt very rapidly, but on the whole labelling is not desirable, particularly if the items in the bottles vary much. The value of the jar is largely in the fact that the contents can be recognised at once and that immediate recognition is more valuable than any label. However, labels are desirable when very similar objects are being stored. A further disadvantage of labelling is that the jars will not be interchangeable because the labels may be in an unreadable position when the jars are screwed up.

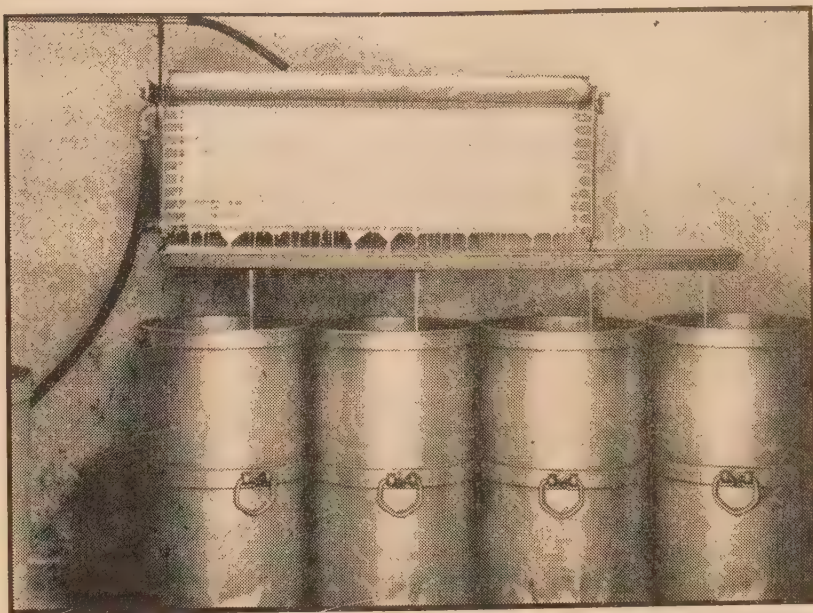
If possible, it is desirable to mount the jars against a light or window, enabling the contents to be seen more readily. If that method is adopted, it is inadvisable to store rubber goods, in them as both light and heat are harmful to rubber.



When space is available pigeon-holes may be made and the jars screwed to the undersides of the shelves. The pigeon-holes illustrated are 12in. wide, 9in. high, and 8in. deep. That leaves ample room for the storing of items that are too large for the jars.

Spreading Fat and Solids in Milk Production

INSTRUCTION in the production of clean milk of low bacterial count is part of inspectional work of field officers of the Livestock Division, Department of Agriculture, and all milk supplied for human consumption must comply with the Pure Foods and Drugs Act. This article by C. E. Broad, Inspector of Stock, Invercargill, deals principally with butterfat tests and less fully with tests for milk solids percentages, which are carried out by Government analysts working in conjunction with officers of the Department of Health, and points out a common defect in milk production—the installation of milking machines in registered dairies without provision for efficient milk-spreading utensils.



[Elmar Studios photo.]

Set-up in the milk house of an efficient spreading system over four cans.

ONE of the responsibilities of field officers of the Division is the administration of the Dairy (Milk-Supply) Regulations, 1939, and in part the Dairy Industry Act, 1908, under which dairy premises are registered for the production and sale of milk for human consumption in every part of the Dominion. Farm premises and plant are subject to inspection and control, and dairy herds are inspected regularly. If evidence of any clinical disease scheduled under the Stock Act exists, affected animals may be condemned. The most common diseases affecting dairy cows are tuberculosis, actinomycosis, and malignant growths, though the quality and purity of milk may be affected by other diseases and conditions such as mastitis, contagious and accidental abortion, feed taints, injuries to the udder, digestive trouble after calving (acetonemia), and absorbed flavours. Under the regulations new milk (colostrum) must not be offered for sale within four clear days of calving; if still abnormal after then, it should not be offered for sale.

A mechanical defect, such as a leaking water cooler, may also be responsible for adulteration of milk, and as a result the butterfat and milk solids standards are lowered and the producer is liable to prosecution.

A supplier may be notified that a sample of the milk supplied by him and taken by an officer of the Department of Health was defective. The legal minimum requirements are 3.25 per cent. butterfat and 8.5 per cent. milk solids, and though some samples fall below this standard, it can be shown that the required standards may be produced from the same herd.

For example, an official milk test showed that a farmer's can of milk contained 3.2 per cent. fat. Investigation at the source of supply resulted in further tests being taken, covering his total daily output, with the following results:—

Can	Morning Milk				Fat percentage
No. 1	..	..	..	..	3.1
No. 2	..	..	..	..	3.7
No. 3	..	..	..	..	3.4
	Average				3.4
	Evening Milk				
No. 1	..	..	..	..	3.8
No. 2	..	..	..	..	4.7
No. 3	..	..	..	..	5.2
	Average				4.5

The next morning most of the cows which filled No. 1 can were hand milked, and their milks were subjected to individual butterfat tests, which resulted as follows:—

Cow	Fat percentage			
No. 1	..	..	..	5.5
No. 2	..	..	..	5.8
No. 3	..	..	..	5.0
No. 4	..	..	..	4.1
No. 5	..	..	..	3.8
No. 6	..	..	..	3.8
No. 7	..	..	..	4.0
Average				4.6

Those tests showed that the defect was not of hereditary origin and that every can of milk contained a different percentage of fat.

Fore Milk

The fore milk of a cow is always low in butterfat content. To show to what

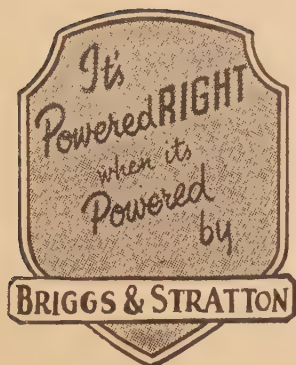
extent that is so, one cow was half milked evenly from the four quarters, then similarly milked out, and two samples taken of fore milk and two of last milk. Each sample of fore milk contained 2.2 per cent. of fat and each sample of last milk 6 per cent.

The following figures taken from Lucius L. Van Slyke's book "Modern Methods of Testing Milk and Milk Products," published in 1927, dealing with variation of fat content in different portions of milk drawn from the udder, illustrate the general rule that the first milk drawn contains least fat and the milk drawn last (strip-pings) is richest in fat:—

	Percentage of fat in milk		
	Cow No. 1	Cow No. 2	Cow No. 3
First portion drawn ..	0.90	1.60	1.60
Second portion drawn ..	2.60	3.20	3.25
Third portion drawn ..	5.35	4.10	5.00
Fourth portion (strip-pings) ..	9.80	8.10	8.30

It is also known that the percentage of fat in milk varies in different quarters of the udder of a cow, and also varies in each quarter with the order in which the teats are milked.

Attention was then turned to the farmer's plant and milking operations. A three-cow plant doubled up was in use, six cows being milked at one time, some of them producing little because they were nearing the end of their lactation period. When the second six were about half milked the 10-gallon can under the cooler was filled and replaced with an empty one,



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and so on until the third can took the place of the second, was filled, and the milking completed.

The defect was that six cows' whole milk had been weakened by six cows' fore milk, clearly indicating why the first can of milk did not contain the legal minimum of fat content.

For the next milking a three-can milk spreader, stocked by all milking machine agents and dairy specialists, was used, and further milk tests were taken to illustrate the necessity and effectiveness of a cheap utensil. (Spreaders, which can be bought in all sizes, are cheap, a four-can spreader costing 15s.)

Results of the milk tests taken were:—

Can	Fat percentage			
	Morning Milk			
No. 1	..	..	..	3.6
No. 2	..	..	..	3.6
No. 3	..	..	..	3.6
	Evening Milk			
No. 1	..	..	..	4.5
No. 2	..	..	..	4.6
No. 3	..	..	..	4.5

Those six tests, which were carried out by an officer of the Dairy Division, were taken from cans which were filled simultaneously and evenly at each milking.

Herd-testing Officers' Tests

Tests taken by herd-testing officers are carried out on milk samples which are true and composite representations of both the evening and morning milk of each cow, particular attention being paid to the quantity of milk given at each milking. For example, the testing officer takes as near as practicable 20 cubic centimetres from the evening milk, and takes the same proportion from the morning milk. Therefore, from a cow giving 10lb. of milk in the evening 20 c.c. are taken, and if in the morning she gives 15lb., 30 c.c. are taken; from a cow giving 7lb.

... SPREADING OF FAT AND SOLIDS IN MILK

in the evening 12 c.c. are taken, and if in the morning she gives 21lb., 36 c.c., or three times as much, are taken. A composite check test is also carried out at both milkings by the herd tester. The officer carries a container of about half-gallon capacity, into which he puts 1 c.c. for every pound of milk produced by each cow, so that at the end of each milking he has a composite sample of all the milk.

Mixing the evening and morning milk is undesirable, as the reductase test result will be defective. To bring about a more even test with both milkings, milking hours should be regular and if possible at 12-hour intervals.

Another producer's official milk sample, taken on July 31, 1947, was assessed at 2.9 per cent. of fat and 8.4 per cent. of solids other than fat. The farmer was testing his cows under the South Island Herd Improvement Association, and following are results of tests on milk samples, covering 19 cows, taken on August 18 and 19, 1947, by the herd-testing officer:—

Cow	Fat percentage			
No. 1	..	..	..	4.2
No. 2	..	..	..	3.3
No. 3	..	..	..	3.9
No. 4	..	..	..	4.9
No. 5	..	..	..	4.4
No. 6	..	..	..	3.1
No. 7	..	..	..	4.0
No. 8	..	..	..	3.6
No. 9	..	..	..	3.5
No. 10	..	..	..	3.5
No. 11	..	..	..	3.3
No. 12	..	..	..	4.1
No. 13	..	..	..	3.8
No. 14	..	..	..	3.3
No. 15	..	..	..	5.0
No. 16	..	..	..	4.0
No. 17	..	..	..	5.4
No. 18	..	..	..	4.1
No. 19	..	..	..	3.9
Average	..	..	..	4.0

After being interviewed first the producer decided to give the herd a supplementary feed consisting of one bag of crushed oats, one bucket of meat meal, half a bucket of linseed meal, and one bucket of bran daily, and the number of cows milked had increased from 19 to 25 when investigations were begun at the shed. A two-cow plant was operating with a defective two-can milk spreader and a defective milk vat, and three cans were used for the evening and four for the morning milk. Samples were tested with the following results:—

Can	Fat percentage			
	Evening Milk			
No. 1	..	..	..	3.9
No. 2	..	..	..	4.2
No. 3	..	..	..	4.9
Average	..	..	..	4.3
	Morning Milk			
No. 1	..	..	..	3.6
No. 2	..	..	..	3.3
No. 3	..	..	..	3.7
No. 4	..	..	..	3.8
Average	..	..	..	3.6

A new four-can milk spreader and a new milk vat were installed for the next three milkings, and the more even spread of the fat percentage through the cans at both milkings is reflected in the following tests taken by an officer of the Dairy Division:—

Can	Fat percentage			
	Evening Milk			
No. 1	..	..	..	4.2
No. 2	..	..	..	4.2
No. 3	..	..	..	4.2
	Morning Milk			
No. 1	..	..	..	3.6
No. 2	..	..	..	3.5
No. 3	..	..	..	3.6
No. 4	..	..	..	3.6
	Evening Milk			
No. 1	..	..	..	4.1
No. 2	..	..	..	4.1
No. 3	..	..	..	4.1
No. 4	..	..	..	4.1

Milk Solids

Proteins, sugar, and ash combine to form milk solids other than fat. The percentage of milk solids is higher in fore milk than in strippings, and the following table clearly shows the fluctuations of one cow's milk, drawn as evenly as possible from each quarter to make four composite milk samples which were submitted to the Government analyst for testing:—

Sample	Quantity of milk	Fat (per cent.)	Solids other than fat (per cent.)
No. 1	.. 4 pints	2.75	8.45
No. 2	.. 4 pints	5.25	8.25
No. 3	.. 4 pints	6.10	8.10
No. 4	.. 2 pints	9.50	7.55

Though no specific example is given concerning a defective milk solids test, from the above analyses it is obvious that the cow tested does not make the grade in milk solids, but it is apparently reasonable to assume that instead of the first can of milk being below standard in solids other than fat where no milk spreader is in operation, and the herd can produce compositely the required minimum of 8.50 per cent. milk solids, the defective sample would be found in the last can of milk. Feeding, age, breed, and period of lactation of cows are factors which are known to affect milk solids other than fat.

Efficient Milk Spreading

For a milk spreader to be completely efficient, it is necessary for all milk from the releaser to be diverted into a milk vat first, so that the milk flow over the cooler can be controlled to the extent that the spreader is kept reasonably full during the whole time the herd is being milked.

By such control uniformity in cooling temperature is also achieved. The farmer avoids losses caused frequently under the old system through

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in May as under:—

Auckland—1YA, on May 25, at 12.35 p.m., "Some Problems in Pig Raising," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on May 20, at 12.35 p.m., "Cheap Feed is the Basis of Profit: Plan to Grow Crops," by I. H. Owtram, Supervisor, Taranaki District Pig Council.

Christchurch—3YA, on May 17, at 12.35 p.m., "How the Supervisor Learns His Story," by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

SPREADING OF FAT AND SOLIDS IN MILK . . .

the can overflowing and the milk finding its way into the main drainage system before the full can is replaced with an empty one. With an efficient milk spreader system the farmer should have to go into the milk house only to regulate the flow from the milk vat after milking has started, enabling him to devote all his time to operations in the cow-shed.

As both machines and water pump are usually driven by one motor, little milk should remain in the milk vat

to be cooled and spread after the last cow has been milked, so that shed and plant are cleaned with the least possible delay.

Where as few as two cans are used to receive milk at one milking in either a hand or a machine shed, a milk vat and milk spreader are essential. The spreader should be big enough to cope with the total number of cans during the flush of the season and be used in the same way throughout the year. Every can must be

plunged, even if it is only partially full, before cans which are to be collected by the retailer are filled.

To save using unnecessary cans and having to wash them during the winter, when the milking herd is reduced, say, to only half the summer numbers, an extra milk spreader could be acquired with the requisite number of outlets to cover the total number of cans used for the morning milking, when most cans are in daily use, and based on the flush seasonal period of production. The holes in this spreader would be larger, because it would be filling fewer cans, and the same number of cows would be milked as in summer, this being governed by the number of units on the milking machine.

A more desirable alternative to the additional spreader would be the manufacture of a convertible milk spreader—one which would have the maximum number of outlets to correspond with the total number of cows milked during the summer and with a tap at each outlet so that a six-can spreader could be converted into a five-, four-, three-, or two-can spreader. Taps would also facilitate an even flow into each can.

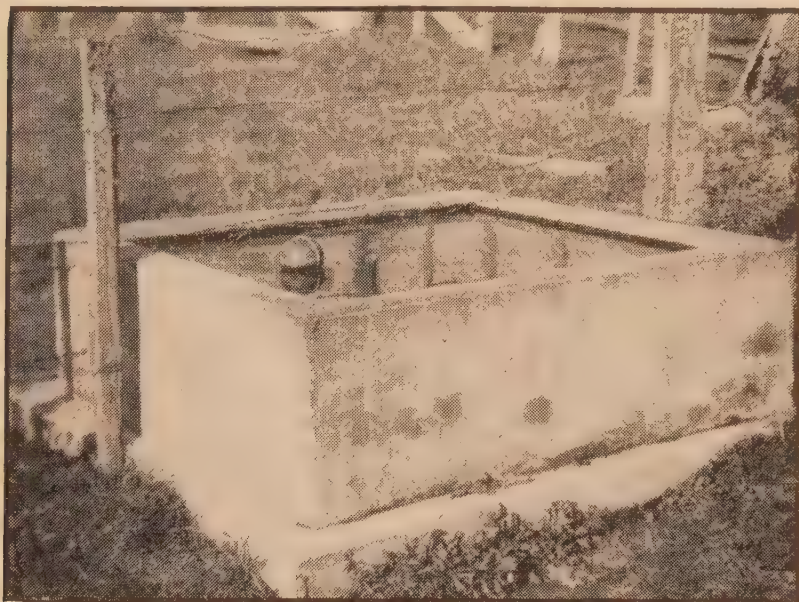
Use of Plunger

When milking is finished the plunger should be used so that all the milk in every can is thoroughly stirred. It is also important that retailers use a plunger frequently with every can of milk to ensure that the last pint of milk sold will be just as nutritious as the first, or a good producer's efforts may be undone.

Where bulk supplies of milk are handled and bottled in treating houses, the mixing of various town producers' supplies usually results in a desirable mean of butterfat content, but a 10-gallon can of milk below the legal butterfat minimum and distributed among 80 pint customers by a producer-retailer or a straight-out retailer who draws his supply from the producer is likely to lead to the consumers' complaining that the milk is poor and looking for another source of supply.

An efficient milk-spreading system cannot put butterfat or milk solids into every can of milk to comply with the legal minimums if the entire herd cannot produce them. Where a herd is defective, herd testing is the only solution, which entails the culling of low-testing, unprofitable cows and the introduction of proven sires and dams, plus the rearing of selected progeny. Even with selected pedigree herds, where cows are tested for certificate-of-record purposes, daily variations in milk tests occur. Bulletins No. 51 and 139, obtainable at all offices of the Department of Agriculture, will explain the reasons for this.

HOME-MADE CONCRETE WATER TROUGH



[H. Senior Clegg photo.]

If a good water supply is available, water can be reticulated and made readily available to stock by well-placed troughs throughout the farm, and for farmers fortunate enough to have suitable gravel or sand already on their farms the cost of trough construction is reduced considerably.

The 150-gallon square water trough illustrated was made on the farm by Mr. M. F. Hingston, of Owthango, South Auckland. It has an inside measurement of 4ft. x 4ft. x 18in. deep and requires only two-thirds of a yard of gravel and two bags of cement to construct.

After the site is selected 6ft. x 6ft. of the turf is removed and the ground levelled. A length of $\frac{3}{4}$ in. galvanised pipe is then so placed that the end comes up through the centre of the floor of the trough. A concrete base or floor 5ft. 6in. x 5ft. 6in. x 2 $\frac{1}{2}$ in. is then laid with the end of the pipe protruding a few inches. The boxing for the 4in. thick walls or sides is next placed in position and after being well stayed the boxing is filled with reinforcing and concrete. When the concrete is set sufficiently the boxing is removed and the inside of the trough is painted over with cement and water as a safeguard against leaks. The ballcock is then fitted on to the pipe in the trough, which is then ready for filling.

The base requires one bag of cement and one-third of a yard of gravel and the walls the same amount of materials.

—E. G. STANTON, *Fields Instructor, Taumarunui.*

Making the Best Use of Pastures Grown from Certified Seed

By C. C. LEITCH, *Assistant Fields Superintendent, Christchurch.*

Economic Use of Land

THE New Zealand system of seed certification, by which all the main seeds of importance to the farmer are closely scrutinised both in the field and after being machine dressed before being termed "Certified seed," probably has no equal in any other country. This article discusses some aspects of making the best use of such seeds and deals mainly with perennial ryegrass, Italian ryegrass, white clover, and Montgomery red clover, which constitute the major portion of seeds under the scheme.

THE food situation almost the world over is very critical; foodstuffs of every kind are required in large quantities, and during the next few years all efforts should be devoted to supplying them. The grazing animal and its products are therefore of first importance, and it should be ensured every opportunity to produce its best. That means careful study of its requirements, and in this country grass is the most important item of feed, so, if maximum food production is to be obtained from the farm, good pastures should be the objective. A well-balanced rotation should be a basis of all farming operations.

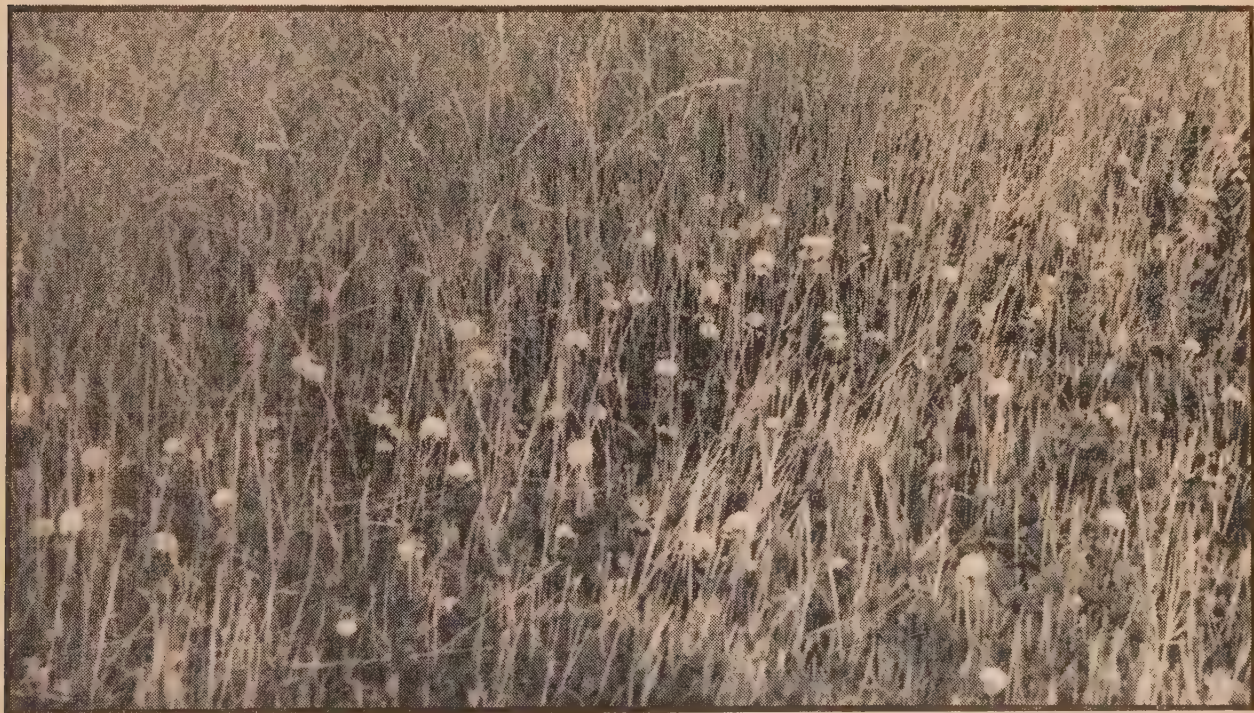
Emphasis sometimes tends to be placed on seeds rather than on feed for animals. There is every justification for a concentration on the products from the grazing animal during the next few years, as the prices recently announced for meat and dairy produce are very attractive.

In the early years of the seed certification scheme many mistakes were made in the production of perennial ryegrass seed. One was the very heavy rate of seeding irrespective of the germination of the seed, and in quite a number of cases this overseeding was responsible for low yields and loss of feed for stock. Another was the sowing of perennial ryegrass without clovers; in some cases volunteer clover came in, but in most cases it was absent, causing disappointing results. The methods adopted in those early years were probably responsible for setting the scheme back about five years. Late sowings also resulted in low production at harvest. Fortunately, some growers did know something about seed production, and they were responsible for the greater part of the good yields.

It was soon discovered that if ryegrass was to be a success, it must be grown with clovers, and that if clovers were sown, the amount of ryegrass could be reduced with beneficial results to both the clover and the ryegrass. Today ryegrass is nearly always sown with white clover, and thus another factor in management is introduced. It has made possible the harvesting of the area in the first season for ryegrass and in the second season for white clover, giving the area two years of usefulness for seed production; by skilful management it also gives the maximum feed for the stock—in other words, economic utilisation.

Italian Ryegrass

With Italian ryegrass conditions are somewhat different from those of the perennial ryegrass-white clover sward, because the role of the comparatively short-lived Italian ryegrass is the production of quick, bulky, nutritious feed. If it were possible to get the palatability and quick growth



White clover growing in a short-rotation ryegrass crop.

PASTURES GROWN FROM CERTIFIED SEED . . .

of Italian from perennial ryegrass, carrying capacity would be increased considerably.

Italian ryegrass requires different management from perennial. Its quick growth when sown under the right conditions requires proper control if the best results are to be obtained. With its introduction into the certification scheme, new methods in grazing were required to obtain a good seed yield. If the sward was grazed too close in the spring, the seed yield was usually affected. It was soon found that for good yields the grazing technique had to be modified so that at no stage was the area eaten down shorter than 1 in., allowing for good recovery. The grazing in the autumn can be much closer than in the spring.

At first Italian ryegrass was sown alone, but it was found that white clover or Montgomery red clover could be sown with it, thus giving an extra year's and sometimes two years' life to the area, with excellent feed for stock. It also enables the harvesting of the clover crop in the second year, thus increasing the farmer's returns.

Italian ryegrass seed is a difficult crop to harvest. If maximum returns are to be obtained, the crop must be cut with the binder and left in stooks for at least three weeks before being threshed.

Montgomery Red Clover

Montgomery red clover has a definite place in the pasture mixture, but unfortunately the high price ruling for the seed during the past few years has been responsible for the saving for seed of many areas that should have been ploughed up because of their low yields. Montgomery red clover has been very disappointing to some growers, but on the clay downs in

South Canterbury and elsewhere it is the main red clover sown. Probably its greatest disadvantage is the very late seed harvest, which in England makes the harvesting of seed very risky. Its tendency to second growth probably has the worst effect on the saving of seed.

Over the years two types of management have been evolved: Grazing until the end of November with a first-harvest area and a fortnight earlier for older stands; or taking a hay crop and then allowing the area to go to seed. Both methods have their good points and in the main circumstances must decide which to use.

Time to Plough Up

The obvious answer to the question of when a field should be ploughed up is when it becomes uneconomic, but unfortunately that is not always carried out, several factors causing areas to be left when the right thing to do would be to plough them.

In the early years of certification perennial ryegrass was harvested in the first instance from areas that were five or more years old, and a newly-sown area had to pass through four harvests before it could produce Certified Mother seed, and then only if the plot indicated a satisfactory standard. That caused quite a few areas in Canterbury to be retained for seed production until they were up to five years old so that locally-grown Certified Mother seed could be obtained, even though they might only produce five bushels of seed to the acre.

With the introduction of the pedigree strain of perennial ryegrass and the consequent elimination of the age qualification for certification, it was expected that the tendency to harvest an area for four and five seasons would be overcome, but unfortunately, because of the high prices ruling for this seed, the same procedure was adopted, resulting in a loss of grazing, a reduction in yield, and the marketing of seed with a high proportion of goosegrass.

Experience has shown that the best system with perennial ryegrass is to take the first seed crop, which is always the most profitable, and graze the area for the remainder of its life. With the ryegrass-white clover combination the position is somewhat similar except that the white clover seed crop would be taken in the second season.

Drawbacks of Montgomery Clover

Montgomery red clover is probably responsible for more poor pastures after the first harvest than any of the other crops that are saved for seed. The bulky growth in its first year usually smothers out any ryegrass and

white clover that may be present, and after harvest the porina caterpillar takes its toll. As a result areas are to be seen with a few scattered plants, but they are usually left for another year in the hope that some recovery will take place. Only the high price of seed has kept such areas barely economic.

With Montgomery red clover the loss in grazing is far greater than with any of the other crops; in some cases nine to twelve months must pass before the area can be grazed. The remedy is to graze the area for the first year, take a seed crop, then graze again, taking a seed crop every second year. Some of the best yields have been obtained from areas that were allowed to get well established—not harvested until the second year—and they were harvested for three years in succession without any deterioration in the pasture.

It is probable that the loss in grazing because of the depression in growth caused by taking the seed crop is much greater than would appear, and that is why perennial ryegrass-white clover and Italian ryegrass-white clover are possibly the best combinations in all respects. The white clover, taking longer to establish with perennial ryegrass, is not depressed in the first season, comes away well in the second harvest, and gives both feed and seed. It is in the third season that the pastures receive a check, but not as great as where ryegrass is dominant.

This check after seeding requires some investigation, because if that difficulty could be overcome the combined programme of feed and seed production could be continued for several seasons.

If one seed crop is taken and the area then grazed, and if the pasture is not invaded by porina and grass-grub, it can be safely said that on most mixed farms five to seven years is about the economic life of the field. During that period sufficient fertility will be built up to warrant ploughing, taking a wheat crop, following with a fodder crop, and sowing to new pasture again.

"COUNT" IN WOOL

C.H.W., Nuhaka, Hawke's Bay: Fineness is generally specified in the wool trade in terms of spinning ability, and is expressed most generally in the Bradford count system. The "count" is determined by the number of standard hanks of yarn, each 560 yards long, which can be spun from 1 lb. of combed "top." For example, if 1 lb. of combed "top" is drawn out to 56 hanks of 560 yards, such a wool is called 56s count. An article on woollen manufacture which is to be published in an early issue of the "Journal" will answer your inquiry more fully.

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SUBSCRIBERS to the "Journal of Agriculture" can greatly assist the work of distribution by:—

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Every endeavour is made to have the "Journal" delivered on time, but if delay should occur, subscribers should make sure that it has not been caused by failure to notify their post office of a change of address or by any other delay after dispatch from the Department before they lodge a complaint with the Department.

Exchange must be added to cheques drawn outside Wellington. Payment by postage stamps should be avoided. Stamps of large denominations cannot be accepted.

CARE OF LIVESTOCK DURING MAY

Contributed by the Animal Research Division.

ROTATE the calves round the farm ahead of the cows to allow them to have the first pick of the grazing. There will be plenty of grass left for the cows and it will make all the difference to the calves, which will not thrive if kept in one calf paddock. The benefit to be derived from rotational grazing is clearly set out in a table published in an article, "Weaning Calves and Lambs," in the December, 1947, issue of the "Journal." Calves not doing well should be drenched with phenothiazine. Sometimes, especially in bright, sunny weather, phenothiazine causes blindness in calves. This may be prevented by keeping them in a shed or other dense shade during the day after drenching.



["Dairy Exporter" photo.]

If young horses are unthrifty, become weak, or show signs of colic, they may be suffering from red worms. A drench of phenothiazine before the winter will often help, but this should, if possible, be given under veterinary supervision, as some horses are very susceptible to poisoning by this drug.

* * *

Winged and variegated thistles can be very poisonous for cattle, which should not be grazed in paddocks where they have little else to eat. The local officer of the Fields Division should be consulted about the best way of eradicating thistles. Nitrite poisoning of cattle grazing winged and variegated thistles is described in an article which appeared in the April, 1947, issue of the "Journal."



["Dairy Exporter" photo.]

Fowls showing signs of loss of condition and some lameness may be infected with tuberculosis, which may spread to pigs and result in condemnations at the works. Consult the nearest Government Veterinarian and ask him to examine birds suspected of having tuberculosis.

* * *

The young green pasture which often grows in autumn provides suitable conditions for the spread of worm parasites. Drench lambs grazing such pasture with phenothiazine, giving the full dose recommended on the label. The less thrifty of the flock should be drafted off and put into a paddock of good feed which has not carried lambs since Christmas. These lambs should be drenched every three weeks.



["News Photo Service photo.]

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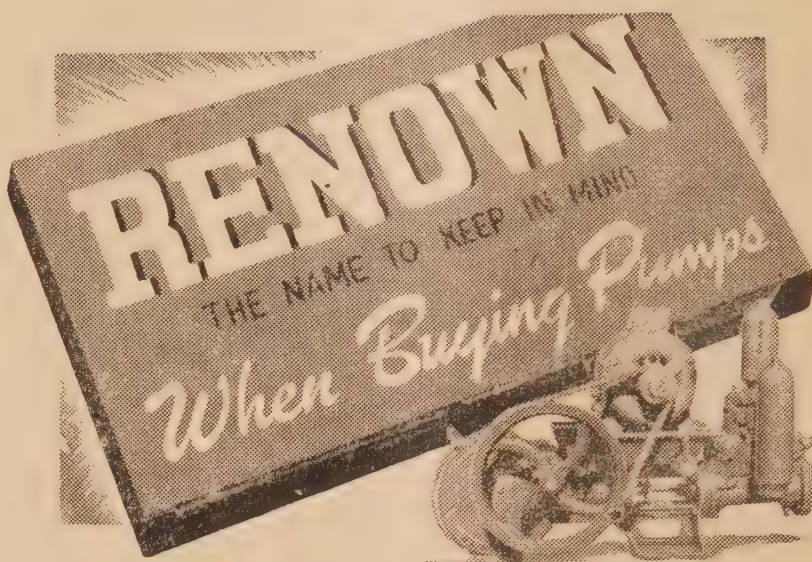


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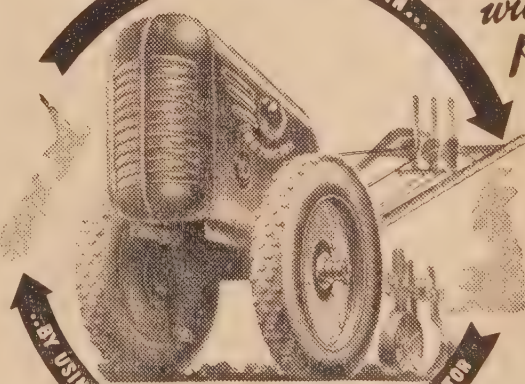
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Overrun in Commercial Buttermaking

THOUGH the significance of overrun in commercial buttermaking is perhaps not clearly understood by all butterfat producers, it is of considerable importance to the dairy industry. In this article D. Hull, Dairy Instructor, New Plymouth, explains how overrun is obtained and shows the effect the short-crediting of butterfat suppliers has on overrun.

THE term overrun has been used for many years in connection with the profit accruing when butterfat is manufactured into butter. Of latter years the term yield has been used in describing the yield of butter obtained from the manufacture of 1lb. of butterfat. The terms overrun and yield have the same meaning. The fact that 1lb. of butterfat will make up into more than 1lb. of butter is of great monetary importance to the butterfat producer. The overrun in buttermaking is made up of the constituents other than butterfat that go into butter. They are water, salt, curd, and ash, and 100lb. of New Zealand export butter contains approximately 82lb. of butterfat, 15.7lb. of water, 1.6lb. of salt, and .7lb. of curd and ash.

Some butter factories efficiently managed have averaged less than 82lb. of butterfat in every 100lb. of butter for the season, and have therefore been able to incorporate more water, salt, curd, and ash into the butter, with a consequent higher overrun. The maximum amounts of constituents other than butterfat that can be added in buttermaking for export are governed mainly by the

regulations under the Dairy Industry Act, which provide that 16 per cent. of water and 2 per cent. of salt shall not be exceeded. Therefore there are limits to the amount of overrun that can be legitimately obtained. The incorporation of approximately 18lb. of water, salt, curd, and ash with 82lb. of butterfat is quite legal and honest, and the profit made from this ordinary commercial practice is sufficient to pay all the costs of a butter company from farm gate to f.o.b. and still leave a substantial balance to be distributed among the suppliers.

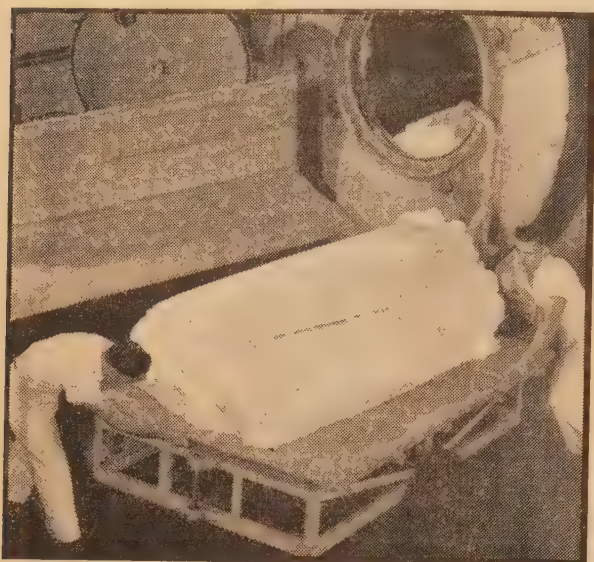
The percentage of the constituents of the overrun to the amount of butterfat in the butter made is published in all dairy company balance sheets for the information of the suppliers, and when overruns are discussed it is usual to define them as percentages, for example, a 19 per cent. overrun or a 21 per cent. overrun.

Types of Overrun

There are three types of overrun, which can be described as "theoretical," "practical," and "competitive." The theoretical overrun is based on theory and more or less ignores the human element. The practical overrun is the one with which the butter factory supplier is mainly concerned, and it relates to that which can be fairly achieved in butter factory practice throughout the year. The competitive overrun has been employed occasionally in an endeavour to make the payment per pound of butterfat made by a factory appear greater than it actually is and higher than that of neighbouring factories or companies.

Photograph in heading by National Publicity Studios.

OVERRUN IN BUTTERMILKING



[National Publicity Studios photo.]

The overrun in buttermilking is made up of the constituents other than butterfat—water, salt, curd, and ash—that go into butter. In 100lb. of New Zealand export butter there are approximately 82lb. of butterfat, 15.7lb. of water, 1.6lb. of salt, and 7lb. of curd.

There is nothing wrong with a competitive overrun provided that it can be substantiated, but where an overrun is inflated by the short-crediting of butterfat to the suppliers the result is a competitive overrun of the worst type. To say the least, it is unfair competition.

Factors Determining Overrun

The practical factory overrun can be defined as the difference between the butterfat that is paid for and the butter that is sold. The three main factors that determine an overrun are:—

1. The butterfat content of the butter made;
2. The mechanical losses in manufacture, and
3. Whether or not the suppliers are credited with all the butterfat supplied by them.

1. Butterfat content: The factory that has a low butterfat content in the butter can, all other factors being equal, substantiate a higher overrun than a factory with a higher butterfat content in the butter.

2. Mechanical losses in manufacture: The factory that has low mechanical losses in buttermilking can, all other factors being equal, substantiate a higher overrun than a factory with higher mechanical losses. It is impossible to make and market butter without losing butterfat in the buttermilk and without giving away at least 2oz. of butter to each 56lb. box as "trade allowance." There are also various other unavoidable mechanical losses, and the sum of all losses reduces the percentage of overrun, because less than 99lb. of each 100lb. of the butterfat received is left for buttermilking. The greatest mechanical loss is the loss of butterfat in the buttermilk. In every 100lb. of butterfat received by a butter factory about 1lb. is lost in the buttermilk.

3. Crediting of butterfat: If the suppliers are short-credited, the factory overrun is unduly inflated and the annual payout appears to be higher than it actually is,

but the supplier is no better off financially. It has been claimed that an unfairly-inflated overrun has been of benefit to the suppliers, but this is not borne out in practice.

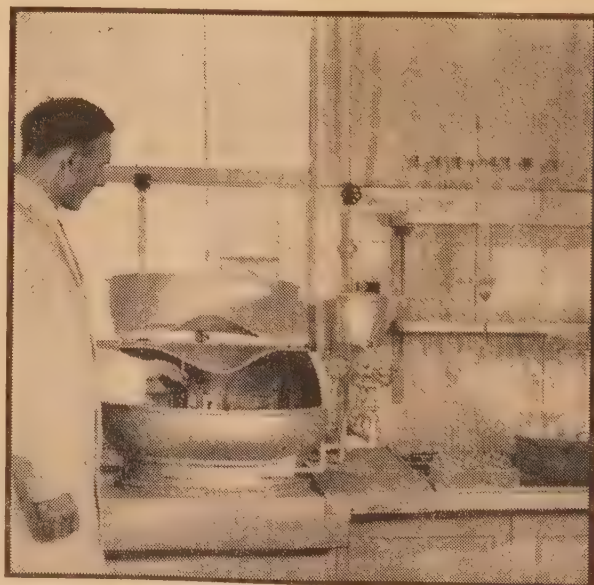
Though the unavoidable mechanical losses that occur in buttermilking reduce all overruns, there have been instances where a dairy factory has had a greater amount of butterfat incorporated into the butter than the suppliers were paid for, despite the factor of the mechanical losses in manufacture. It has to be admitted, however, that the amount of butterfat found in the butter by analysis must have been received over the stage at the factory.

Unfairly-inflated Overrun No Gain

At no time has there been a gain to suppliers by an unfairly-inflated overrun, but during the period that farm cost allowances were paid for separately there were cases of monetary loss to some suppliers, as the farm cost allowance was paid on the amount of butterfat credited to suppliers and not necessarily on the amount actually supplied.

It has been said that even if suppliers are short-credited, and the overrun and annual payout thereby inflated, there is no loss to the suppliers, as they are all treated alike. As the system of payment for butterfat is based on weight and test, it is impossible to treat all suppliers alike. The loss to the supplier entailed by the short-crediting of 1lb. of cream with a supply of 20lb. would be much greater than with a supply of 100lb. The short-crediting of one point in test of a 36 per cent. cream would also be much greater than with a 42 per cent. cream.

At most well-directed and well-managed butter factories a low butterfat content is obtained in the butter made, a strict check is kept on mechanical losses in manufacture, and every endeavour is made to credit the suppliers with all of the butterfat received. The result may not be a very high overrun, but the overrun represents maximum skill and care in manufacture and conscientious crediting of the butterfat received. The supplier gets "all there is in it," and no more can be expected.



[National Publicity Studios photo.]

The Babcock system of butterfat testing, used almost universally in New Zealand butter factories to determine the butterfat content of deliveries of cream, is the basis of payment to suppliers.

Importance of Damage by Cheese Mites

By PHYLLIS L. ROBERTSON, *Entomology Division, Department of Scientific and Industrial Research, Cawthron Institute, Nelson.*

MITES as stored product pests have assumed prime importance in many parts of the world, including New Zealand, since the outbreak of the Second World War. In the Dominion attention was directed particularly toward the part they play during the manufacture and storage of cheese. During the First World War, when cheese shipments were delayed and cheese had to be kept in temporary stores without temperature control, heavy losses were sustained through mite damage. During the recent conflict, as part of the Government programme to ensure against the recurrence of this problem, a special study of the biology and control of cheese mites was undertaken by the Entomology Division.

CHEESE mites are frequently confused with other pests and the damage they cause is not always understood. They are so minute that their presence may not be suspected until they are already too well established in inaccessible parts of the cheese to be killed readily. When mite infection increases to a dangerous degree it becomes apparent as an accumulation of "dust" on the surface of cheese, on factory shelving, and around cheese crates.

Mites are not insects but are related most closely to spiders. When magnified they can be seen to be colourless, in some cases semi-transparent, with globular, glistening bodies bearing long, flexible hairs. The mouth parts appear to be efficient weapons for the demolition of cheese, and four pairs of legs—not three, as insects have—protruding beyond the margin of the body provide rapid locomotion. Wide distribution is further ensured by especially-resistant forms which may be produced at one stage of development. These forms are protected by a hard, shell-like covering, have no mouth parts, can subsist for months without food, and are able to attach themselves by suckers to flies, moths, or any other insects which offer the opportunity for a free ride.

Mites are frequently confused with cheese "skippers," which are, however, much larger, being readily seen by the naked eye. They are the young or maggot stage of a fly sometimes found in cheese rooms and are rare in New Zealand cheese, though they may be

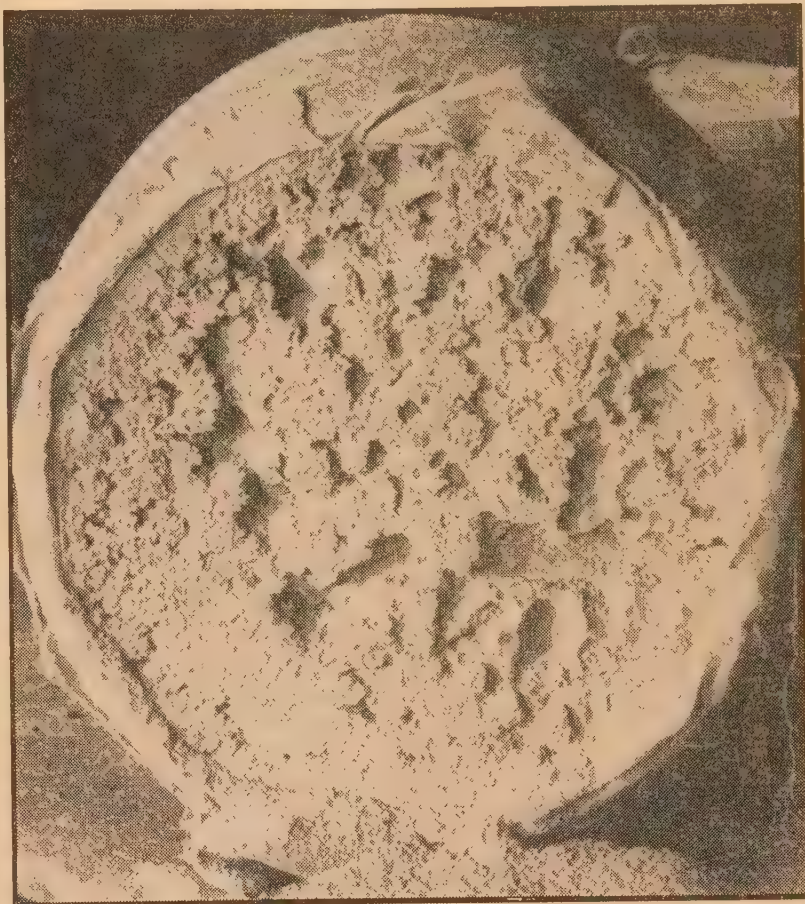
seen commonly in the more mature types of cheese marketed overseas.

Development of Mites

Many people are mystified by the appearance of mites in cheese, and may even consider that they originate from the cheese itself. However, mites follow the time-honoured custom of originating from eggs and are spread by means which are easily recognised and not at all mysterious. They come not from within but from outside the cheese. Their association with it is the result of their own capacity for rapid movement, the remarkable speed with which they multiply, and the fact that both eggs and later stages can be spread readily by insects, human beings, animals (such as rats and mice), wind, and similar agencies.

A female mite lays probably several hundred eggs in her life, which is by no means short, as was noted when isolated specimens were retained in the laboratory under generally favourable conditions, but at the rather low temperature of 50 degrees F.; they remained alive for seven months, and a number appeared capable of surviving for much longer.

Cheese mite eggs hatch into six-legged larvae in less than a week at normal curing room temperatures (55 to 65 degrees F.). This is followed by two successive eight-legged, nymphal stages, the transition from one to the next being marked by the shedding of the old skin, as in insects. The special, non-feeding, distribution form mentioned earlier is an extra nymphal



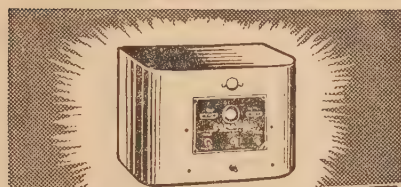
[B. B. Given photo.]

The surface of a slow vat cheese, showing mite damage after a year and nine months in a factory curing room.



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RECENT research by the New Zealand Department of Agriculture has proved that milking inflations should be changed regularly. It has been found that slack inflations tend to slow up milking, and slow milking tends to cause "strippy" cows and lower production. Old inflations harbour bacteria and, when slack, could result in increased mastitis. Dirty inflations cause second-grade milk.

The Department recommends that inflations be changed every six weeks if milking up to 15 cows per set per milking; more frequently if more cows are milked.

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stage which is produced only sometimes. Adults develop from the nymphs, the whole period of development from egg to adult occupying only about three weeks.

Damage to Cheese

Even when cheese mites are recognised as pests it may be difficult to realise the extent of the damage of which they are capable. When cheeses are held in a factory curing room for, say, three or four months, mite debris will probably accumulate sufficiently to be seen with the naked eye, but at this stage there is little if any trace of damage to the cheeses. Only when curing is extended to nine months or a year does their destructive power become obvious. Then, when the mite "dust" is brushed off and the bandage lifted, the whole cheese surface will be found to be honey-combed. What was, when manufactured, a smooth, slightly-convex surface has become hollowed out and eaten away to an incredible extent. One mite about 1/50in. long may seem harmless, but the concerted effort of the multitude which builds up in a few months under favourable conditions is by no means so.

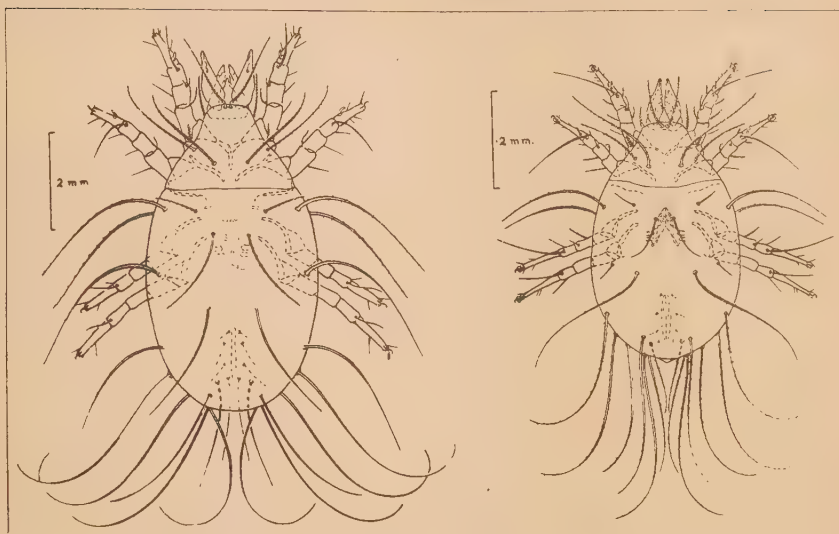
During a year's curing a cheese may lose up to a tenth in weight and, though normal shrinkage and other factors must be considered, much of that loss is attributable to mites. However, the monetary value of the weight of cheese eaten by mites cannot be considered an approximation to the loss they cause the cheesemaking industry. When cheese is well matured, small cracks may develop which enable the mites to permeate it. To make this cheese marketable the retailer must cut away all mite-injured portions, so that the amount wasted finally far exceeds that eaten by mites.

Prevalence of Mites

Cheese mites are almost as common as cheese—probably no factory curing room in New Zealand is entirely free from them. That seems inevitable, as curing room conditions are almost ideal for breeding mites. Their most essential requirements are a moist atmosphere, darkness or at least dim lighting, temperatures generally above 50 degrees F., the presence of at least traces of their favoured foodstuff—cheese—and plenty of cracks and crevices in which they can breed unchecked. All these requirements are abundantly provided for in the average factory curing room.

However, though mites are so constantly associated with the manufacture and storage of cheese, only during prolonged storage are they recognised as major pests. "Slow vat" cheese is held in factory curing rooms in the midst of high-grade export and local-sale cheese which is constantly passing out from the factory. Under

DAMAGE BY CHEESE MITES



Diagrams of the two common species of cheese mite.

conditions so favourable to their development heavy infestations of mites invariably build up on it, so that it becomes a source of infection for all cheese produced by the factory.

Not Unimportant

The serious damage mites can cause to cheese stored for long periods without adequate temperature control may be overlooked in some factories. That is understandable, as the principal objective of the industry in New Zealand is the production of cheese for export. Export cheese is usually held in factory curing rooms for only two to three weeks, after which it is dispatched from the factory for grading and cool storage before shipment. Export cheese remaining for so short a time in the factory does not acquire any obvious signs of mite infection, even if the curing room is heavily infested. Factories are concerned only with the condition of the cheese when it is graded, and any trace of mite infection is not at that time sufficient to affect grading. In the initial curing, factories must concentrate on the control of such factors as mould, which will inevitably reduce grading, rather

than on pests such as mites, the destructive effect of which will not become apparent until some time in the future.

However, there is no doubt that mites should be recognised as at least a potential menace to the New Zealand cheese industry. They cause widespread and, to some extent, avoidable losses on the local market and also increase the difficulties of cheese processing, an industry which is now assuming considerable importance. Moreover, at times such as the present, when overseas trading conditions are abnormal, these pests may at any time become a serious danger to export cheese accumulating in New Zealand because of shipping delays.

Experiments in Control

J. Muggeridge, Entomology Division, and R. M. Dolby, Dairy Research Institute, recently tested a comprehensive series of control measures against cheese mites. Initial tests were on a small scale in the laboratory, any methods which appeared promising then being tried out on a commercial scale. Control measures investigated and their comparative values are:—

Waxes: A number of types suitable for coating cheese, including paraffin, several proprietary waxes, and butterfat, were tested severely, but in every case they were penetrated by mites. Waxing of cheese was proved to retard but never prevent mite damage.

Dusts: Dolomite, magnesite, serpentine, sulphur, and calcium carbonate were tested on shelving around cheeses as mechanical barriers against mite attack. Under the humid conditions of cheese storage they soon clogged, the surface then becoming sufficiently solid for mites to cross the barrier and



[B. B. Given photo.
Cheese mite eggs.

CHEESE MITES . . .

reach the cheese. Thus dusts were also found to be ineffective for the control of cheese mites.

Ammonia was the first cheese fumigant subjected to experimental trials. Though ammonia gas was shown to be highly toxic to mites, in practice it did not prove satisfactory for cheese fumigation. A major disadvantage was the rapidity with which the gas was absorbed both by the cheese and by wall materials such as brick and concrete. As a result it became impracticable to attempt to produce and maintain a concentration of ammonia sufficiently high to give an effective kill of mites under commercial storage conditions.

Methyl bromide was found to have a number of advantages over ammonia as a cheese fumigant. Of prime importance was the fact that it was absorbed by cheese to only a very small extent, and experiments in a commercial store showed that a satisfactory kill of mites could be obtained if steps were taken to overcome stratification of the vapour. However, a factor prohibiting the general use of methyl bromide in New Zealand cheese factories and stores is its very high cost.

Dichloroethyl ether as a fumigant was judged by the experimenters a more satisfactory means of controlling cheese mites than any other which they had investigated. They found that it was extremely toxic to mites, so that very low concentrations were sufficient for control. It also proved easy to apply, and the cost of application was small. As a result of the investigation recommendations for the general use of dichloroethyl in New Zealand cheese factories have been circulated through Massey College during the past few years. Satisfactory results in practice have been obtained using dichloroethyl ether either as a vapour or as a liquid. In the first case special vaporising apparatus is required and the room must be gastight; when vaporised a dosage of 8oz. to 1000 cubic feet of room space is used. When applied as a liquid the substance may be brushed on to shelving at the rate of 1lb. to 1000 cubic feet of space.

The cheese mite investigation carried out by the Entomology Division during the war was of quite wide scope. It included surveys of factories and stores to discover the extent of mite infection and exactly what mite species were involved, a study of their habits, and an assessment of the most suitable control measures to be applied under various conditions. The practical knowledge gained should be of value not only for the protection of export cheese under emergency conditions of storage, but also for increasing protection to both export and local-market cheese under normal manufacturing routine.

Harrowing of Pastures to Spread Droppings

By E. M. BATES, *Instructor in Agriculture, Hawera.*

TO dogmatise about pasture harrowing is unwise in view of the divergent opinions held by experienced farmers, particularly about the need for grass cultivation of dairy pastures. Disposal of the stock droppings on dairy farms by harrowing is less controversial.

THE time of year greatly influences the nature of the dung according to the proportion of fibre in the feed. The laxative effect of lush young grass results in relatively-soft droppings more easily disintegrated in moist conditions, such as in spring. In exceptional cases soft dung presents no real problem for a considerable period of the year; dense swards making strong growth keep the soft dung pats off the ground and they rapidly disintegrate and disappear without being harrowed. Grazing on overmature, fibrous, summer-grass roughage and winter feeding of fibrous supplements such as hay harden the dung, which may persist for long periods on the pasture if undisturbed.

Autumn Harrowing

Summer accumulations left until autumn growth begins destroy the pasture underneath and promote rank growth, neglected by stock, round the droppings. Yorkshire fog, a winter grower, frequently develops in this way.

Early harrowing is especially valuable where soil fertility is not high, because ryegrass, which demands high fertility, through harrowing is able to make good use of the fertiliser before winter slows up growth.

Winter Harrowing

Unevenness in pastures not adequately harrowed during the winter will be accentuated in spring. The growth of rough, unpalatable grasses distributed throughout the sward not only harbours pests but will prove difficult to control by grazing alone. Flat weeds also rapidly invade bare ground left by the decaying droppings.

Under systematic winter rotational grazing with supplementary feeding,

efficient harrowing on the dairy farm is generally accepted as an integral part of the grazing routine, necessary from the start of autumn growth right through to the spring.

Grass Harrows

To be efficient, grass harrows must disintegrate droppings without damaging the pastures. If pastures are opened up to weed invasion by a tearing harrow, or if the hold of shallow-rooted species such as ryegrass is loosened, damage to the sward must result ultimately. The requirement of ryegrass is rather for consolidation, which it receives by stocking.

Heavy chain harrows are very satisfactory on rotationally-grazed paddocks for harrowing after the stock during the winter and early spring. The ground is covered quickly, as the draught is light, even with a wide spread, and the harrows are easily pulled sideways through gateways.

Light tripod and chain combinations are popular grass harrows, as they shift hardened dung which the chains alone usually leave unless the pasture is very bare.

Drastic Harrowing

A penetrating harrow is frequently used on pastures to tear out rough grasses, for opening up sod-bound pastures, or for scratching a seed-bed on very inferior swards with a view to surface sowing of seed on the existing sward at a seasonable time of the year. This procedure is seldom claimed to be satisfactory in improving good ryegrass swards.

Invasion of moss in pasture is more an indication of low carrying capacity and lack of hoof cultivation—a condition which harrowing alone cannot rectify.



Harrowing to spread droppings and even up the growth of the sward is a recognised part of grazing routine on dairy farms. This pasture shows the result of neglecting harrowing.

Maintaining Soil Fertility in the Orchard

By L. R. RENOUF, Orchard Instructor, Alexandria.

A FERTILE soil is the basis of successful orchard management. Vast quantities of plant nutrients are stored in the soil, but with continual harvesting of heavy crops the soluble plant nutrients are depleted more quickly than natural processes can replace them. Unless these nutrients are replaced and the soil is kept in such a condition that they are continually available to trees, crops will gradually decline until they become uneconomic to produce.

MAINTAINING the fertility of the soil is the orchardist's chief problem. Soil conditions necessary for maximum plant growth are:—

1. Sufficient moisture, air, and warmth. These factors are largely interdependent. For any particular orchard they are determined partly by natural conditions of situation and soil type, but are greatly affected by the management.
 2. Proper balance of mineral plant food.
 3. Adequate supply of organic matter.
 4. Absence of injurious properties.
- Correct management aims at producing these conditions as far as possible, but the method of achieving them depends on individual conditions.

Cultivation

By aerating the soil and conserving moisture by the destruction of weed growth and the creation of a soil mulch, cultivation prevents excessive evaporation in dry periods and yet facilitates the evaporation of excess soil moisture. It is also the means of incorporating organic matter into the soil.

The disadvantage of excessive cultivation is the depletion of the humus supply in the soil by the exposure of large quantities of this material to air, causing it to be given off in gases. Continued clean cultivation without replenishment of humus will cause soils to run out very quickly.

Drainage

For the maintenance of healthy and long-lived trees drainage is of the greatest importance. Varieties of fruit trees vary in their susceptibility to "wet feet," but all trees do poorly if conditions are soggy for any period. A soil can be warm and well supplied with moisture and air only if it is well drained.

In wet soils the circulation of air is poor, the ground is cold, cultivation is difficult, the decomposition of organic matter is retarded, and nitrogen is lost by the action of harmful organisms, creating very poor conditions for trees. If a soil is not well drained naturally, it should be drained artificially.

Role of Organic Matter

Productive capacity is governed to a large extent by the supply of organic matter in the soil. The decomposition of organic matter results in the formation of a complex substance, humus, which is an indispensable constituent of all fertile soils. Soils that have lost their humus "run together," becoming hard and baked, and stunted tree growth results. Humus improves the moisture-holding capacity of the soil, and soils well supplied with it give up more moisture to trees in dry seasons than depleted soils.

Apart from its capacity to improve texture, structure, and moisture conditions, humus provides a home for the countless organisms which act on the fertilising elements and make them available to plants. It also assists in

preventing loss by leaching of nitrogen, potash, and calcium. A high humus level is desirable, but consistent renewal of organic matter is more important.

Deficiency of organic matter in orchard soils may be responsible for many present troubles.

Supply of Plant Foods

For the successful growth of all plants and trees a number of nutrient elements are necessary. They are:—

Derived from air and water	Hydrogen Oxygen Carbon	} Required in relatively-large amounts
Derived from soil	Nitrogen Phosphorus Potassium Calcium Magnesium Sulphur	
	Iron Manganese Boron Copper Zinc	
		} Required in relatively-small amounts

Of the nutrient elements obtained by the plants through the soil all but four, nitrogen, phosphorus, potassium, and calcium, which are depleted more quickly than natural processes can replace them, are present in most soils in sufficient quantities for successful plant growth. That is not always



A cover crop of partridge peas two months after being planted.

MAINTAINING ORCHARD SOIL FERTILITY. . .

so, and when one of the elements required in relatively-small amounts (usually referred to as trace elements) is deficient, the position can be rectified by the application of that element.

Nitrogen, phosphorus, and potassium (classed as essential elements), when present in sufficient quantities, constitute a balanced food for crops. Unless all are present in suitable proportions crops are likely to suffer. Though required in only small amounts as a plant food, calcium is an essential element, and is needed in greater quantities as a soil improver.

The effects of the four essential elements on fruit trees are:—

Nitrogen causes marked development in the vegetative growth of trees, particularly in the leaves, and assists in promoting a fruitful condition. A deficiency causes poor growth, sickly yellow foliage, and small fruit; early defoliation and poor fruit setting are also associated with deficiency. An excess delays maturity and causes weak, sappy growth very susceptible to attack from insect pests and fungus diseases.

Phosphorus (phosphate) hastens maturity and assists in the development of root growth and strong blossom and fruit formation. A deficiency results in the development of bronze leaves and early defoliation.

Potassium (potash) promotes the growth of woody tissues and improves the texture, colour, and keeping qualities of fruit; trees well supplied with potash are more resistant to disease. Dull and scorched leaves and early defoliation are often symptoms of potash deficiency.

Calcium (lime), though required in only small amounts as plant food, is a governing factor in soil fertility. It neutralises acids formed in the soil and materially affects the development of soil bacteria in the decomposition of organic matter. It helps to hold phosphates in the soil and liberates otherwise-unavailable potash. It improves the mechanical condition of all soils, heavy or light, breaking up heavy clays and binding together the soil particles of lighter soils.

Application of Fertilisers

A balanced combination of nitrogen, phosphates, and potash is necessary for the development of trees and fruit, so complete fertilisers containing all three elements are generally recommended. However, many factors must be taken into account, and it is difficult to make general recommendations about the time of application and the kind and rate of fertiliser to apply.

The type of soil, the kind of fruit grown, and particularly the management of the soil must be considered.

For instance, if leguminous crops have been used for green manuring, the fertiliser applied should contain a relatively-high percentage of phosphate and potash and a low percentage, if any, of nitrogen, as quantities of this element will be returned to the soil with the crops. Local advice should be sought about the application of fertilisers to individual orchards.

If the general soil conditions, such as texture, air, moisture, and supply of organic matter, are favourable, the application of artificial fertilisers will give very beneficial results. However, if only artificial fertilisers are applied year after year, crops will decrease eventually because the organic matter in the soil will have decreased.

Provision of Organic Matter

It is doubtful if sufficient consideration has been given to maintaining soil fertility by supplying organic matter in many New Zealand orchards. The addition of organic matter to the soil results in an increase in numbers of soil organisms, mainly bacteria, which decompose the material. In the process plant nutrients are changed into forms available to trees and plants. Humus is the eventual result of decomposition. Humus slowly oxidises when in contact with air, and large amounts are lost from the soil each year. Continued clean cultivation aggravates the loss by exposing more humus to air than does a system of partial cultivation.

The method of building up the organic matter in orchards in New Zealand depends entirely on the nature of the soil and climate in the district, but in most cases one of three methods can be adopted—green manuring by growing crops in the orchard, growing crops outside the orchard and carrying the material on to it, or using farm-yard manure.

Green Manuring

Green manuring means incorporating in the soil any vegetative growth, but in particular crops grown for the purpose. Where it is possible it is the cheapest and most practical means of improving the humus content of the soil.

Green crops should not be grown where the rainfall or irrigation water is insufficient for the needs of the crop. Crops grown under such conditions will compete with the trees for moisture and develop at the expense of the trees, so other methods of supplying organic matter to the soil should be considered. On the other hand, in districts with heavy rainfall the growing of a green crop through the winter will be of benefit in absorbing some of the excess moisture.

The effects of green crops on frosts are another important aspect of green manuring in districts where frost fighting has to be resorted to for protection of the fruit crop. Green crops growing during the spring will increase the severity of frost by as much as two degrees, which could mean the loss of the fruit crop. In such circumstances clean cultivation is necessary during the danger period and a green crop should not be planted until the danger is over or in late summer or autumn.

The selection of a green crop will depend on local conditions, but where possible it should be one of the legumes. As well as supplying organic matter to the soil, legumes have the power of absorbing nitrogen from the air by means of the bacteria in the nodules on their roots. Therefore they are able to thrive without the aid of applied nitrogen, yet when turned in return fair quantities of nitrogen to the soil. Leguminous crops may contain from 80 to 100lb. an acre of nitrogen received from the air in addition to that absorbed from the soil, which means that the equivalent of from 400 to 500lb. of sulphate of ammonia an acre is being returned to the soil. Non-leguminous crops are very beneficial in building up organic matter in the soil, but without being fertilised with nitrogenous manures they return very small quantities of nitrogen to the soil.

An ideal green crop would be a legume with rapid growth and succulent tops, which will give bulk of material and decompose rapidly. Ability to withstand injury from tramping is a consideration, but, where green crops must be grown at a time when they will interfere with normal work, planting of alternate rows each year will go some way toward overcoming the difficulty.

Where they can be grown satisfactorily, blue lupins give as good a result as any crop. Other cover crops are partridge peas, clover, mustard, black barley, rye corn, and oats. A combination of partridge peas and oats at the rate of two bushels of peas to one bushel of oats gives a greater bulk of material than either on its own and makes a very satisfactory green manure crop.

A dressing of 2cwt. of superphosphate to the acre on these crops and 1½cwt. of sulphate of ammonia on non-leguminous crops when grown on light, sandy soils will be of material benefit. Fertiliser applied to green crops is not lost. When the crop is incorporated in the soil and decomposes the fertiliser is made available to the trees.

Time of sowing crops depends on local conditions, but usually the most satisfactory period is during January and February, so that the crop may be

MAINTAINING ORCHARD SOIL FERTILITY



[Sparrow Industrial Pictures Ltd. photo.]

An excellent crop of blue lupins to be turned under as green manure. Where they can be grown satisfactorily blue lupins give as good a result as any crop.

turned in in the late autumn or early winter. For growing through the winter March planting is most satisfactory.

The stage at which to work green crops into the soil is more important with non-leguminous crops. The most beneficial time is when succulence is near its maximum and abundant tops have been developed—at the flowering stage and before seed development—because then large quantities of moisture are carried into the soil with the crop and the drain on soil moisture is less, the plants are richest in plant nutrients, and decomposition is more rapid. The younger the crop the more rapid the decomposition, because as the plant matures the proportion of carbon to its nitrogen content increases.

The soil organisms responsible for decomposition gain their energy from carbon and their food from nitrogen, so the more carbon present the greater the amount of nitrogen required in the decomposition of the material. When strawy organic matter or non-leguminous green crops are incorporated in the soil, tremendous biological activity is initiated and the soil organisms multiply rapidly. As they must have large quantities of nitrogen to break down this organic matter, they use that which otherwise would go to the trees. Nitrate and ammoniacal nitrogen disappear, and until the decay organisms use up the added matter and diminish in number trees will be seriously starved. This nitrogen starvation does not occur when a leguminous crop is used or when a non-leguminous crop is grown with the addition of artificial nitrogenous fertiliser.

Bringing in Material

Taking into the orchard in a green state material grown outside constitutes green manuring. The nutrient value of such crops without their roots is not as high as that of crops grown in the orchard, but they have the advantages of not competing with trees for moisture during growth or inconveniencing work in the orchard. The roots of a green manure crop grown in the orchard supply a large weight of organic matter to the soil and in leguminous crops contribute worth-while amounts of nitrogen, but, where the production of green crops in the orchard is not practicable because of insufficiency of moisture, carrying in green material is the most satisfactory method of building up organic matter.

Dry matter such as hay or straw carried on to the orchard contributes valuable amounts of organic matter and varying amounts of plant nutrients, but it has several disadvantages. If the material is from the orchard property, it can be spread at reasonable cost, but when it has to be bought and freight and cartage paid this system is an expensive method of building up soil fertility. The nutrient value of dry material is not as high as that of green crops. Leguminous material such as clover hay or pea and bean straw is of more value than meadow hay and grain straws, which are very low in nitrogen content.

The decomposition of dry material causes a sudden heavy demand on soil moisture. Dry straw needs about two and a half times its own weight of water to wet it thoroughly, which means that for every ton of straw

applied 560 gallons of water are required. In districts with heavy rainfall the application of dry material during the winter would be very beneficial, but in low-rainfall districts dry material should be applied only when sufficient water for its demands is assured, or the possibility of mulching to build up organic matter should be considered. (An article on mulching of orchards appeared in the "Journal" for October, 1946.)

The more mature a crop the more nitrogen required for its decomposition, and with dry matter other than leguminous material it would be necessary to apply quick-acting artificial nitrogenous fertilisers to prevent nitrogen starvation of the trees, again increasing the cost.

Dry material takes considerably longer to decompose than green material. Working strawy material into the soil in conjunction with a succulent green crop will hasten decomposition.

Discing or rotary hoeing of green crops or material carried on to the orchard is to be favoured instead of ploughing for incorporating organic matter in the soil, as it ensures even distribution throughout the surface layer, hastening decomposition and preventing excess acidity.

Applying Farmyard Manure

Under New Zealand conditions of farming insufficient farmyard manure is available to treat orchard soil on a large scale, but where it can be obtained it is a very valuable contribution to soil fertility, containing all the essential elements of plant food.

FARM WORK FOR MAY

By the Fields Division.

WINTER FEEDING

Cows: As cows dry off in May the milking cows should be given the best feed available on a rotational grazing system. The dry cows should follow the milkers to clean up paddocks, which should then be well chain-harrowed. This enables closing of the last of the paddocks for saved grass. Winter rotational grazing by the dry cows, with necessary supplementary feeding on each paddock in turn, is economical in grass growth and tends to make paddocks for wintering more uniform.

Pasture hay is the main and often the only supplement available during winter, about 15cwt. per cow being required. It is often of very variable quality, but the poorer hay should be fed out first to the dry cows. A maintenance ration for an in-calf heifer is from 12 to 15lb. of good hay with 50lb. of roots, which is equivalent to about 50lb. of good silage. Hay should be fed out before roots; silage may need supplementing with hay. The calves should be the first stock to be given small rations of hay and roots to accustom them to these feeds before grass growth falls away.

Sheep: Winter feeding of sheep is required in some districts during May. If grass growth is scarce, a start may be made with feeding the breaks of soft turnips to hoggets and failing-mouth ewes. Poorer-quality hay and silage should be reserved for the dry stock. If fed to wet stock, this feed should be fed out early, when the needs of animals are least, and before growth from pastures is too meagre.

After it has been well cleaned up by cattle dry country lying to the sun is the most suitable for hoggets. Pastures subsequently should be kept short by allowing cattle to run with the hoggets. When they are about a year old hoggets have tender gums, which make grazing on turnips and swedes difficult unless they are the first stock to consume the tops.

Supplementary feeding of breeding ewes should be commenced before there is a tendency to lose condition. In the feeding of supplementary fodder too sudden a change in diet is detrimental. Stock should not be fed on frozen roots, and some balancing of roots with hay is required.

Pigs: Good weaner weights are essential to profitable pig production. Carefully-balanced rations are required, with greater quantities of cheap home-grown food as weights increase. As cows dry off in May greater reliance is placed on wintering pigs on roots and pasture supplemented with meat meal and grain. Sugar beet is the best root crop and about $\frac{1}{4}$ acre per sow will supply the bulk of feed for wintering litters farrowed during the autumn. Unless fouled by prolonged grazing or overstocking, grass is cheap and healthy feed, and saves the extra feed cost incurred when pigs are cooped up in winter.

Young pigs are very susceptible to disease, which is often caused by unsanitary conditions such as overcrowding, badly-drained sites, and dirty and draughty sties.

CEREALS

In the main wheat-growing areas winter wheat is sown in May and June. In the final preparations for a seed-bed the surface should not be worked too fine, or it will cake after rain. Small clods of earth on the surface are an advantage with autumn-sown crops, but the tilth should be fine and firm underneath. The cultivator is the best implement to use, but should not be used if there is a danger of bringing sods to the surface. Cross 7 is the most popular winter variety, as it does not lodge or shake readily; Fife Tuscan is used chiefly on lighter wheat lands. The usual winter sowing is from 90 to 100lb. per acre, but lighter sowings on lighter land under lower rainfall are

usual. To control ball smut all seed should be dusted with one of the mercurial dusts at the rate of 2oz. per bushel before sowing, this work generally being done by seed-dressing firms. It is usual to sow 1cwt. of superphosphate with wheat, and where attack from grass-grub is feared this assists young plants past the early stages, when they are most likely to be injured or killed.

In maize-growing districts harvesting of crops into cribs is easier after several frosts have been experienced. Cribs should be overhauled and repaired if necessary before harvest.

PASTURES

Many new autumn-sown pastures will receive their first grazing in May, and for this purpose light stock, preferably sheep in good mobs, are best. Grazing too close should be avoided at any time, but the rapid-growing species should not be allowed to grow strongly and smother clovers before pastures are regrazed. The phosphatic top-dressing of pastures should have been done earlier in autumn, but may still be done where winter growth is reasonable. Lime may be applied at any time except when the ground is too soft and pastures are liable to be cut up.

POTATOES

South Island potato crops will continue to be dug during the month. Care in digging, handling, and storing will reduce dry rot infection later, especially in potatoes forwarded to the North Island, where the disease spreads rapidly in the more humid climate.

When stored on the farm potatoes must be adequately protected from frosts and cold, penetrating winds. Baled straw around clamps is satisfactory. A good cover of hay on top will turn the rain and give ventilation.

RED CLOVER CROPS

Crops not yet harvested in dry districts are usually best harvested by direct heading. Some farmers pick up out of the windrow and others stack for spring threshing, but whichever method is adopted, harvesting should be done in favourable weather. In threshing great care must be taken with the setting of the concave to reduce the percentage of cracked seed.

PLANTING TREES

Unless there is ample moisture in April, young trees are best planted out in May. In cold districts where frosts are prevalent June and July are unsatisfactory for planting, which should then be delayed until mid-August or September. It is useless to plant most species of trees where water lies. For permanent planting obtain trees 6 to 12in. high having sturdy tops and stems and an abundance of fibrous roots. Use larger plants on land where there is much weed growth and smaller plants in exposed situations. Young trees must be protected from stock, and fences should be 10ft. or more from trees and 5ft. from hedges that are not stock-proof.

GENERAL

Implements and machinery should be put under cover, and cleaning, repairs, and replacement of parts carried out. Repairs to permanent fences and gates should be made early. If they are well erected, little maintenance may be required other than tightening wires and general attention to posts and battens. Posts showing decay should be reversed. Bog holes and bad crossings should be attended to and additions and repairs made to concrete work.

TRENDS IN PRODUCTION IN THE PIG INDUSTRY

THOUGH the weight of pig meat produced per sow has doubled in the last 20 years, there has been a serious decline in the proportion of sows carried to the number of cows and heifers in milk. Unless this decline is arrested, there will be a large wastage of dairy by-products in the flush of the season—a situation which must be avoided if New Zealand is to meet the urgent demand for aiding Britain by supplying as much food as possible. In this article A. Longwill, Assistant Superintendent of the Pig Industry, surveys trends in production in the pig industry in the last 20 years and points to changes which may be significant and of which producers should be aware.

IN New Zealand, which is one of the heaviest per capita consumers of meat in the world, cattle and sheep have always provided a much larger proportion of the total meat than pigs. This is true of the later-developed pastoral countries generally and is in direct contrast to the position which has developed in more industrialised countries. Before the Second World War New Zealand's per capita consumption of pig meats was estimated to be 8.8lb. of pork and 17lb. of bacon and ham, or only 11.5 per cent. of the total meat consumed.

In the United Kingdom in the same period the figure for consumption of all pig meats was about 45lb. per head and was greater than that for the consumption of mutton and lamb. Fresh pork, mainly home produced, with a little from Empire countries, provided almost half this amount. More than half of the bacon supplies to the Home market came from foreign countries. At the same time consumption of pig meats in most European countries was at a relatively high level and formed the bulk of the meat ration. This it still does, though the total meat available there is inadequate. Pigs cannot be used to increase meat supplies rapidly until there is a surplus to immediate human requirements of grains, potatoes, etc., which form the rations of the pig in European countries. It is thus obvious that the pig, everywhere appreciated as a converter of surplus or lower-grade food into a human food of exceptional value, is at a disadvantage in heavily-populated countries in times of shortage of basic human foods because of war and other causes. In New Zealand, which has



not suffered a shortage of food, it is more than ever important at such times that any of the by-products of primary industries should not be allowed to go to waste if they can be converted into pig meat.

Development of the Industry

In the days before refrigeration enabled the successful establishment of export dairy and meat industries pigs were raised in the traditional way to which the settlers were accustomed. Thus the majority of the pigs were raised in the South Island grain-growing districts up to 1886. From then on a rapid decline in those districts was balanced by an increase in the North Island districts that were being developed for dairy farming. By the turn of the century the number of pigs in the South Island had dropped to about 100,000, around which figure the numbers have fluctuated ever since. The increase in the North Island had not up to that time been sufficient to offset the decline in the South. In fact, the total pig population increased only slowly from the beginning of the present century until the early 1920's, with a temporary setback during the First World War.

With the establishment of the New Zealand Meat Producers' Board in 1922 a new phase in the industry commenced. The board was instrumental in building up a demand in the United Kingdom for New Zealand pig meats, the standards of porkers, particularly,

being praised by the trade right from the start. A drive was made to encourage the production of pigs in the dairying districts and particularly the production of porkers for export. Export killings had increased from less than 30,000 in 1922-23 to almost 160,000 in 1928-29 out of a total kill of about 517,000. Over the five-year period from 1924-25 to 1928-29, 82 per cent. of the pig meat produced was consumed locally.

From then until the depression there was a lull, without any further increase in production. As the result of good preparatory work by pig recording clubs an appreciation was growing of the potential value of the pig in converting the hitherto-despised by-product of the dairy farm or factory into a saleable commodity. Although prices were very low, the return from the by-products used to feed pigs helped the average dairy farmer to keep his head above water, and some idea of the potential production, much of which had previously been allowed to go to waste, is obtained from the fact, as shown in the table on page 395, that the number of pigs slaughtered and the weight of pig meat produced were doubled in the four years from 1932-33 to 1935-36.

Production in the Last 20 Years

The table also shows the salient features of the production of pig meat over the last 20 years. As

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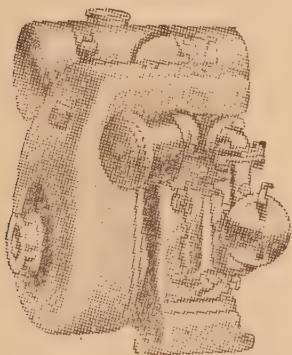
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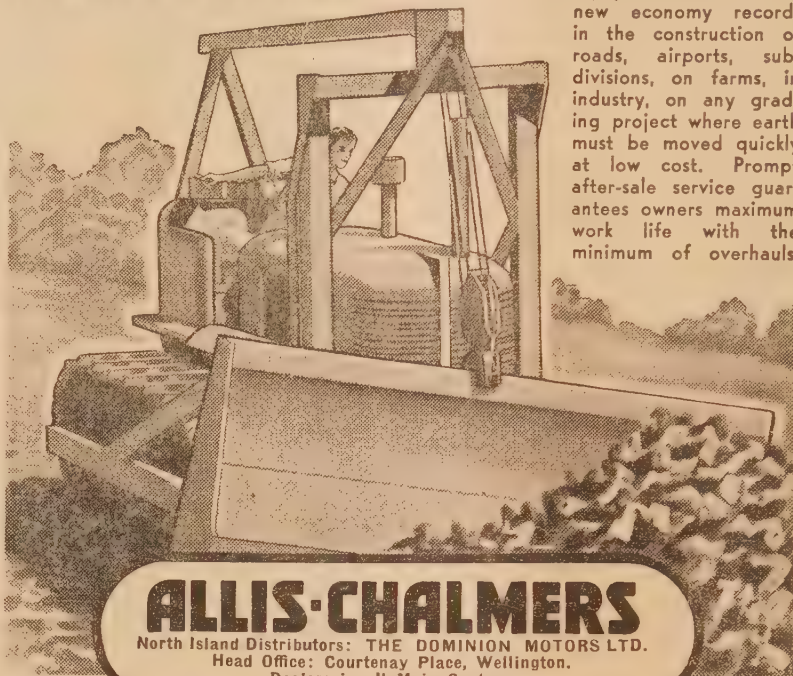
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the industry has developed in association with dairying, and pigs are the main means of utilisation of the by-products of the dairy industry, these features are considered here solely in relation to the Dominion's dairy herd and the total amount of dairy by-products available after allowance is made for rearing replacement calves.

The figure quoted in the table for dairy food units per pound of pig meat produced may need some explanation. The by-products available for pigs, after allowing for calves reared, are equivalent to 2 gallons of skim-milk and buttermilk per pound of butterfat supplied to butter factories and 1.5 gallons of whey per pound of butterfat supplied to cheese factories. In food units this is equivalent to 2 food units and 1 food unit per pound of butterfat supplied for butter and cheese respectively. The total food units thus obtained are divided by the total pounds of pig meat produced in each corresponding year, giving the figure shown in column 8 of the table. This, of course, omits consideration of the varying amounts of supplementary foods used, and the tendency for this figure to increase in recent years is a reflection of the feed position when a scarcity of concentrated feeding stuffs has affected production.

However, this figure is higher than it should be throughout, especially when it is remembered that the addition of supplementary foods used would increase the total figure by about $\frac{1}{2}$ food unit per pound of pig meat. Efficient pig meat production demands that the total food consumption, including sows' requirements, should be no more than 6 food units per pound of pig meat produced. Steady improvement in this direction is evident from the table, but there

... TRENDS IN PIG PRODUCTION

PIG MEAT PRODUCTION IN LAST 20 YEARS

Year	As at January 31 Sows over 1 year old	Dairy cows in milk	Ratio of sows to cows in milk	Pigs slaughtered	For year ending September 30 Weight of pig meat produced (tons)	Cwt. of meat produced per sow	Food units per lb. of meat (dairy by- products only)	Lb. of meat per 100lb. of butter- fat
1928	82,404	1,242,729	1 : 15	476,828	23,835	5.8	7.4	23
1929	74,692	1,291,204	1 : 17	518,025	25,560	6.8	7.6	23
1930	61,706	1,388,872	1 : 23	515,428	25,700	8.3	8.5	20
1931	64,981	1,499,532	1 : 23	525,286	24,830	7.7	9.0	19
1932	75,409	1,582,664	1 : 21	474,094	22,850	6.1	10.3	17
1933	87,686	1,733,913	1 : 20	635,282	29,640	6.8	9.4	19
1934	98,299	1,816,402	1 : 18	772,369	35,500	7.2	8.6	21
1935	111,793	1,827,962	1 : 16	919,929	40,868	7.3	7.2	25
1936	116,058	1,823,358	1 : 16	1,038,236	46,864	8.1	6.6	27
1937	112,921	1,805,405	1 : 16	1,060,057	47,557	8.4	6.8	26
1938	104,803	1,763,775	1 : 17	1,090,524	47,896	9.1	6.3	28
1939	96,754	1,744,478	1 : 18	962,257	42,582	8.8	6.4	28
1940	92,759	1,739,874	1 : 19	873,304	49,437	10.6	5.9	30
1941	100,378	1,779,603	1 : 18	1,006,686	52,623	10.5	6.0	29
1942	91,338	1,777,239	1 : 19	925,982	47,978	10.5	5.7	28
1943*	82,023	1,714,959	1 : 21	772,744	44,320	10.8	6.1	29
1944	77,281	1,647,920	1 : 21	740,913	43,251	11.2	5.9	30
1945	77,202	1,678,943	1 : 22	681,230	42,373	11.0	6.8	26
1946	72,573	1,661,944	1 : 23	664,275	38,437	10.6	6.3	28
1947	67,938	1,657,690	1 : 24	645,728	39,491	11.6	6.9	26

* From 1943 onward estimates of stock in boroughs have been excluded.

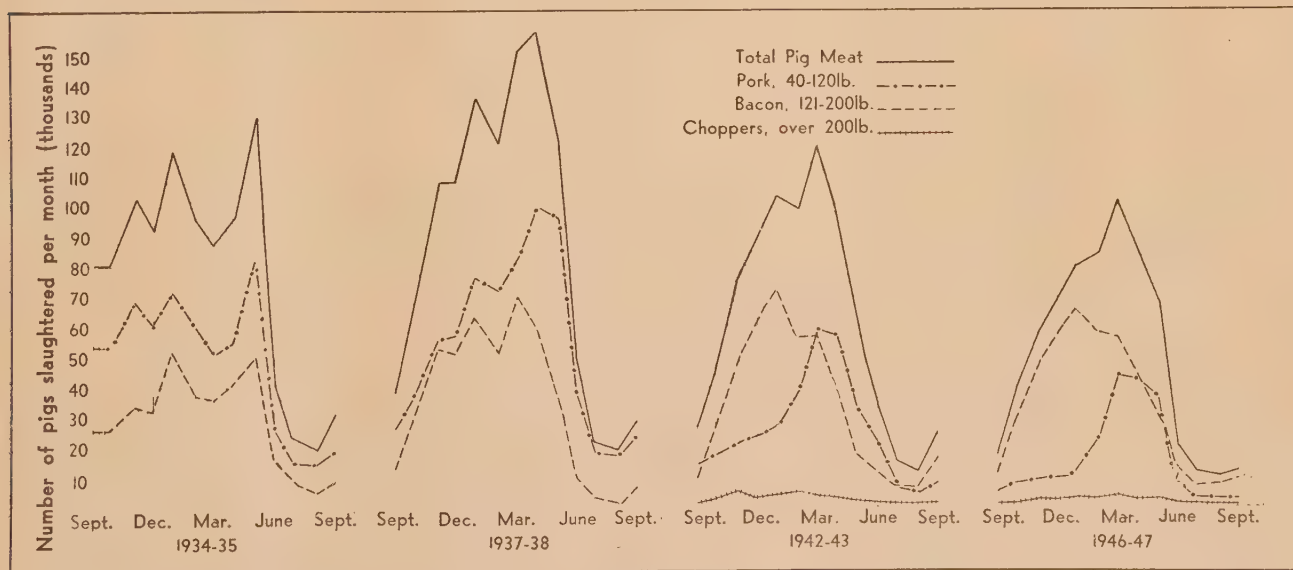
Tonnage figures up to 1934 are round-figure estimates, based on weights estimated by pig producers. Since 1935 the estimates have been based on known average weights of porkers and baconers slaughtered.

is scope for much improvement, especially when it becomes possible to return to a reasonable amount of meal feeding.

If it is accepted that reasonable standards of pig meat production are 40lb. of pig meat per 100lb. of butterfat used for buttermaking and 20lb. of pig meat per 100lb. of butterfat used for cheesemaking, and if the fact that about three-quarters of the butterfat for manufacture goes to butter and only one quarter to cheese is taken into account, an overall figure of 35lb. of pig meat per 100lb. of butterfat should represent a reasonable average level of production under normal conditions in New Zealand. Compared with this

figure, the figures in column 9 indicate that despite a creditable improvement until the wartime difficulties regarding supplementary feeds, there is room for improvement here also. This can be achieved only by the provision of adequate piggery facilities and better management on more farms.

Though the table shows a very considerable rise in the weight of pig meat produced per sow, it is necessary to point out that this has been associated recently with a drop in the numbers of breeding sows to a dangerously-low level. The widening of the ratio of breeding sows to cows and heifers in milk from 1:16 when production was at its peak to 1:24 means



Seasonal variations by classes in numbers of pigs slaughtered. Four representative years have been taken to show the trend toward increasing baconer production. The decline in total pig meat since 1938 is marked.

TRENDS IN PIG PRODUCTION . . .

that there is a danger of returning to the undesirable position of having serious wastage of dairy by-products in the flush of the season. Prices ruling for all growing pigs in saleyards during the spring over the last two or three seasons emphasise this.

A return to 80,000 to 90,000 sows, accompanied by proper supplementary food provision, is the first step necessary to ensure full utilisation of the foods available. If farrowings and food provision are properly planned, there is no reason why the weight of pig meat produced per sow should recede. With improved all-round efficiency it should be possible to aim at 15cwt. of pig meat per sow; many producers are already doing better.

Wartime Production Demands

From the early years of the export of pig meats porker-weight pigs predominated in export killings, and, as roughly the same numbers of porkers and baconers were consumed locally, in total killings also. This was the position until 1939, when 1,000,000 pigs were killed, the ratio of porkers to baconers being 6:4. On the outbreak of war, however, the demand switched to baconers for export, and with the assistance of imports of Australian barley and copra from the Islands it was possible to take the majority of the pigs on hand up to baconer weights. Although there was a temporary reversal because of the vicissitudes of war, which created grave uncertainties in the pig industry and precipitated the reduction of breeding stock in 1941, the Allied Forces in the Pacific supplied a renewed demand for bacon from 1943 to 1945, and baconers, except in the 1941-42 season, formed the bulk of the killings during the war. Present demand from the United Kingdom is for as much pig meat as possible, with preference still for baconer weights.

The graph on page 395 shows clearly the progressive changes which have taken place in the proportion of porkers to baconers coming forward in four typical years. The marked swing to baconer production which took place during the war is evident. This is mainly responsible for the increased weight of pig meat per sow shown in the table on page 395, which shows signs of being continued in the post-war years. The seasonal distribution of killings is interesting and shows the tendency there has been to fit the breeding programme to the feed supply, with the resultant production of the peak baconer killings in the flush of the season and a later peak of porker killings. By farrowing more sows in May and June it is possible to get two litters from the majority of the sows in the season, the first as baconers in summer and the second as

porkers toward the end of the season. An increasing number of farmers who have good conditions for winter litters have been following this practice. A considerable proportion of the baconers at present slaughtered in October-November have been wintered as stores, but this system demands more home-grown food provision than the system of May-June farrowing.

Local Consumption of Pig Meats

Interesting developments have been taking place in the demand for pig meats in New Zealand concurrently with overseas changes in demand. With increased purchasing power, consumption of bacon and hams locally had increased substantially from the pre-war figure and when the quota allocation system was introduced it was stabilised at about 33 per cent. above the pre-war figure. The official estimates of consumption during 1945-46 are 7lb. of pork, including chopper meat in smallgoods, and 22.5lb. of bacon and hams.

As this increase in the consumption of bacon and hams occurred mainly before control and rationing were introduced, it is likely to be a permanent feature of the meat supply situation. At present about 300,000 baconers and 120,000 porkers are required to meet the local market demand. Thus exports account for only a quarter of New Zealand's total production, and the local market is likely to be the more important outlet for the industry in the future unless some unforeseen changes affecting the economics of the industry take place and permit considerable expansion of production.

However, production along the present lines can and should be more than double the local requirements. The economic position of the industry will therefore continue to be dependent on the strength of the overseas demand, and everything possible must be done to stimulate that demand. This must be based on the supply of sufficient high-quality meat to create interest on the part of wholesale operators when free marketing returns.

Producers can best insure themselves against setbacks on the overseas market in the future by increasing quantity and improving quality of production as quickly as possible. Quantity is of paramount importance at present, but it will not be long before quality tells once again. The Wiltshire sides now being sent Home, though acceptable at present, are generally too fat and are tending to be too heavy for the normal British trade. The same is true of those coming into the local market. Producers should aim to finish their baconers between 130 and 160lb. dressed. The first step in accomplishing this is to increase the number of breeding sows.

Committee Appointed to Investigate Dairy Industry Legislation

AS the result of representations made to the Government on behalf of the industry by the National Dairy Federation and the New Zealand Dairy Board the Government has set up a committee to investigate and report on the effect of some aspects of existing legislation in relation to the co-operative dairy companies:

The committee is as follows:—

Mr. H. A. Foy, Director of the Dairy Division, representing the Department of Agriculture, chairman; Mr. C. H. Courtney, secretary of the New Zealand Dairy Board, and Mr. F. W. Groom, office solicitor to the New Zealand Co-operative Dairy Company, Ltd., representing the dairy industry, and Mr. E. C. Adams, District Land Registrar, Wellington, representing the Registrar of Companies. The secretary to the committee is Mr. J. E. Marshall, Head Office, Department of Agriculture.

The matters which have been referred to the committee for investigation and report are:—

1. The necessity for amendments to existing legislation in relation to dry shareholding in dairy companies.
2. The position with regard to Articles of Association with a view to providing more adequately for the modern operation and administration of dairy companies.

The committee will first receive written submissions from dairy companies and any persons interested in the matters under review; any submissions made will be treated in strictest confidence. A preliminary meeting of the committee has been held, and details of the procedure to be followed for the making of submissions will be made available as soon as possible.

The committee proposes to visit certain dairying centres later for the purpose of examining more closely any matters brought under its notice, and dairy companies and all others interested are invited to make written submissions.

MOLE DRAINAGE

The method of mole drainage described in Bulletin No. 170, "Mole Drainage," is confidently recommended to those wishing to put into practice this system of drainage, and farmers particularly are recommended to consider the possibilities of the mole plough where good drainage is required. The bulletin is available free from any office of the Department of Agriculture.

COMBATING CRICKET PEST IN THE NORTH

By P. S. SYME, formerly Instructor in Agriculture, Warkworth.

THOUGH many crop failures are wrongly ascribed every year to crickets, it is nevertheless certain that these insects are responsible for a considerable amount of damage both to crops and pastures. This article describes briefly what can be done by the farmer to combat the pest.

THE damage caused by the field cricket (*Gryllulus servillei*) is difficult to assess. Throughout the greater part of its life cycle the insect is a voracious feeder, attacking alike farm pastures and a wide range of farm and garden crops.

Experience has shown that cricket damage is most likely to be serious after two or three dry seasons on the heavier soils subject to cracking, particularly after drainage and grassing. Crickets are readily destroyed by drowning in wet seasons and are not prevalent on land subject to prolonged winter flooding.

Life History

The eggs are laid in the ground in the autumn in cracks and under logs or cow droppings. The young crickets, which are small, black, and wingless, appear first in January and commence to feed on any green vegetation available. By the end of February they begin to develop wings with the aid of which they are able to hop very rapidly by the middle of March. By mid-April the insects are mature with full wing development and are capable of sustained flight.

Remedial Measures

Effective measures against so active and voracious a pest are apt to be somewhat difficult, and treatment may sometimes have to aim at both prevention and cure. As the majority of the insects over-winter in the egg stage and hatch in late spring and early summer, harrowing in the spring will expose large numbers of eggs to the sun and wind, under which conditions they are quickly destroyed.

As the insect is mainly nocturnal in habit, land which cracks badly in summer readily affords the cricket refuge from its natural enemies such as sea-gulls, starlings, or fowls. Under such circumstances it is not unusual to see areas of pasture utterly ruined in the second or third year after sowing, the culprit indubitably being the cricket. On such land, which is particularly susceptible to attack, special precautions may be desirable.

Paspalum is Resistant

Experience has shown that paspalum is better able than most plants to resist cricket attack. Two fields inspected in the autumn of 1943, one second- and one third-year pasture, totalling about 20 acres, were found to have been almost completely denuded of vegetation by cricket attack, practically the only surviving plants being a few odd plants of paspalum. Both fields had previously carried a nearly-perfect sward of rye-white clover. Observation suggested that had the paspalum been thickly established, the damage done would have been much less serious.

Quick Paspalum Establishment

Experience emphasises the value of securing early establishment of paspalum on such land. This may sometimes be achieved by sowing paspalum by itself in the spring and then sowing the balance of the seeds mixture in the following autumn. Provided all goes well, the paspalum should be strongly and densely established by the second or third season after sowing, the stage in the pasture development when cricket attack often proves most serious. Alternatively, where conditions favour an early autumn sowing the inclusion of a generous proportion of paspalum in the mixture will do much to speed up the establishment of this valuable plant.

Besides resisting cricket attack, paspalum helps to shade and bind the soil and does much to prevent that cracking so commonly associated with a dense cricket population. Quite apart from these considerations, however, the quick establishment of paspalum on many farms throughout the north is eminently desirable. Its proved value as a summer producer and drought resister justifies a considerable effort to secure its speedy establishment, when it will quickly recoup the farmer for any extra seed sown.

Surface Sowing

If an area of pasture has been badly attacked, severe harrowing followed by the surface sowing of suitable



Adult cricket. At this stage the insects have fully-developed wings and are capable of sustained flight.

seeds in late March or April may help to repair the damage. Since the insects will still be very numerous, severe harrowing is needed to fill in the cracks which provide refuge and so expose the insects to the birds. Once deprived of shelter their numbers will very speedily be reduced.

Unfortunately, the same area will still be liable to serious attack after a dry season in subsequent years until a strong paspalum sward has become established. As any paspalum seed in a late autumn sowing usually gives very poor establishment, surface sowing has obvious drawbacks, though it may be well worth attempting.

Feeding out Hay

As an alternative to surface sowing the feeding out of paspalum hay on the worse-affected areas has much to recommend it. The effectiveness of this method, however, depends very largely on the ripeness of the hay and the number of viable paspalum seeds present. Though feeding out hay may damage a good pasture, it never yet harmed a very poor one; moreover, the trampling associated with feeding out assists in exposing and destroying any eggs laid in the autumn.

Avoid Close Summer Grazing

Too-close grazing of a young pasture in the summer exposes the soil and makes it more liable to crack than if the herbage had been left fairly rank.

COMBATING THE CRICKET PEST . . .

This favours the development of the crickets and at the same time makes the sward much more vulnerable to their attack. This close grazing is particularly dangerous where the paspalum has not had time to become well established.

Poisoning

Little appears to have been done in the poisoning of crickets on a field scale in New Zealand. Adult crickets readily eat poison baits, however, and the following is a recipe which has been recommended by the Entomology Division of the Department of Scientific and Industrial Research:—

25lb. bran
2 quarts mollasses
1lb. white arsenic
3 to 4 gallons water to make a thin mash

Spread at the rate of 4 to 8lb. per acre.

In preparing the bait the poison should first be mixed with the bran; the molasses should then be dissolved in the water and this mixed with the bran containing the poison.

Land which has been well cultivated and sown either with annual crops or pasture does not usually crack

badly in the first summer. Consequently such crops as swedes and turnips, though highly vulnerable, are less liable to severe attack than pastures. Damage to or a loss of annual crops, also, has not the serious implications of a damaged or ruined pasture. Anyone who has seen a promising pasture ruined by cricket attack will appreciate that where it is known that the land is liable to crack and where serious damage is no new experience every precaution practicable should be taken. Proper precautions taken at the right time may well prevent any serious attack from developing and may save the farmer a considerable amount of trouble and expense.

Steam and Water Steriliser for Hive Boxes and Frames

IN commercial apiaries a large number of old combs require to be boiled down each year, and in some cases it is advisable to sterilise the hive supers and frames containing them. The old method of boiling these separately in a copper is slow and laborious and does not completely clean the frames of all beeswax. This article by E. J. Perry, formerly Apiary Instructor, Greymouth, describes the making of a cheap and easily-constructed steam-heated cleaner and steriliser built and operated by Mr. R. Glasson, Blackball.

THE steriliser is made from two 44-gallon drums (preferably galvanised-steel petrol drums) and a portion of a third drum which is welded on to the top of one of the other two drums (marked A in the illustration) to increase its height to 3ft. 6in. This drum stands on blocks to give extra height.

A 1½in. overflow pipe (E) is fixed in drum A 2ft. 8in. from the bottom.

Three inches below the level of this pipe a ½in. rim (C) is welded inside the drum to hold a hive super firmly in position below the working level of the water. The lower ends of the super (D) rest against the opposite side of the drum.

The two drums A and B are connected with ¾in. piping (F) and a union joint (G). This pipe projects half-way across the bottom of drum A.

A similar ¾in. pipe (H) to carry the steam supply (L) is fixed in drum B and is held in position by a metal stay (I) welded on the inside of the drum. This pipe is tapered at the end to a ¼in. opening and meets flush with the opening in pipe F. When steam is turned on it injects the water from drum B to A.

An adjustable pipe (J) for regulating water levels if necessary and for emptying the drums when work is completed is fitted to the bottom of drum B.

Method of Operation

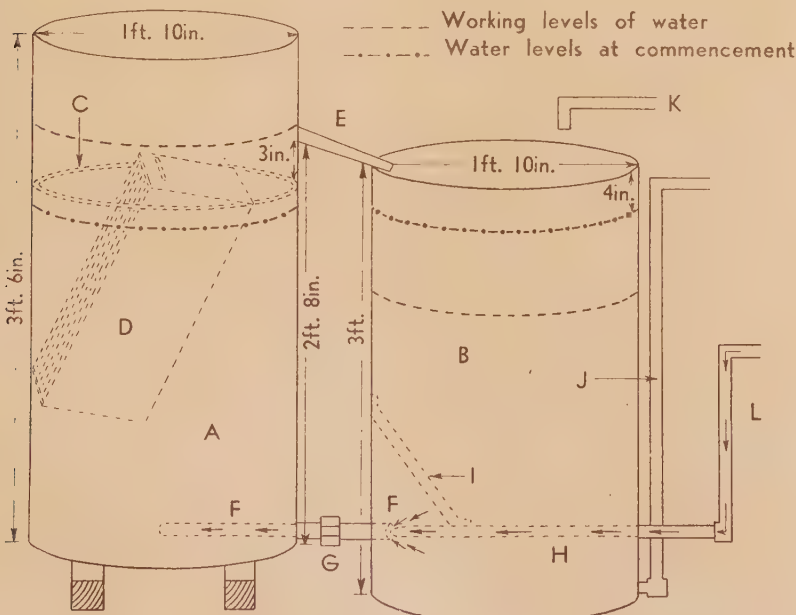
The drums are filled with water from pipe K until the water in drum B is about 4in. from the top and has risen to the same level in drum A, as illustrated. A hive super containing old or used frames to be cleaned is then placed in position and the steam turned on when about 25 to 30lb. pressure has been reached.

The flow of steam drives much of the water from B to A, where the water level rises until it reaches the overflow pipe and begins to circulate when it is boiling. The water level in drum B falls a corresponding amount. As the water boils the super is completely submerged, so there is no need to reverse the super.

Beeswax and water pass through the overflow pipe (E) and while the wax remains on top of the water in drum B there is a continuous circulation of water from B to A and from A to B as long as the steam pressure is maintained.

All wax and debris is taken from the top of drum B with a metal dipper and is dealt with in the usual way. A wire hook is used to remove the supers and frames after cleaning.

Forty or more supers containing frames can be cleaned and sterilised in one day by this method, and though Mr. Glasson prefers to work with 30lb. steam pressure, he considers that 10lb. pressure would be satisfactory, but cleaning would take a little longer because of the lessened agitation of the boiling water.



BLACKLEG DISEASE IN SHEEP

By M. B. BUDDLE, *Senior Veterinary Research Officer, Animal Research Station, Wallaceville.*

BLACKLEG in sheep is prevalent in all districts in New Zealand and can cause heavy mortalities, though prevention is possible by vaccination, and advice on the control of the disease is available from veterinarians or officers of the Department of Agriculture. Blackleg in sheep differs from the disease in bovines in that it is usually evidenced as a "gas gangrene" infection following injuries at shearing, dipping, or dog bites, or after lambing in ewes or castration and docking of lambs. In the past, farmers have recognised the disease as "blood poisoning."

IT is now recognised that the disease in sheep is widespread in New Zealand, and it has been observed in districts where it has not been reported in cattle. Even on the same property some paddocks are notoriously more dangerous than others, apparently because of the heavy contamination of the soil with the causal bacteria. These bacteria are capable of forming spores, a particularly-resistant form which can survive for years in the soil without loss of virulence.

Symptoms of Blackleg

Symptoms are often overlooked until animals are found dead two or three days after castration and docking, shearing, or lambing, but if the animals are more closely observed they may be seen to show the symptoms that would be expected from an acute wound infection with subsequent blood poisoning.

In ewes the symptoms are usually seen one or two days after lambing. The animal ceases to feed and ruminate and seeks isolation from the flock. Usually the vulva and surrounding tissues become swollen and dark, and drops of blood-tinged fluid exude through the adjacent skin and through the skin of the thighs. The ewe remains recumbent, breathing becomes laboured, and the animal appears to be in great pain and distress. Death follows in a few hours.

When animals are infected through shearing wounds there are local signs of gas gangrene infection, as evidenced by darkening of the skin with formation of gas in the subcutaneous tissues. Depending on the site of the lesions, muscular movement is impaired. The course of the disease is very rapid; the animal is soon unable to stand and becomes comatose, and death follows quickly.

Infected lambs usually die on the third or fourth day after castration and docking. There may be little external evidence of gas gangrene infection, but the animals move with

increasing difficulty, soon to become prostrate and die. Recovery from the disease is very rare.

Post-mortem Examination

Putrefaction sets in very rapidly after death, and an examination of the internal organs a few hours after death reveals advanced decomposition. In recently-lambed ewes the wall of the uterus may be red and thickened, and the tissues round the vagina may be infiltrated with red, gelatinous, fluid material. Groups of muscles, particularly those of the thighs and back, may show gas formation, be darker in colour than normal, and in some cases of a dry consistency, or there may be an excess of blood-stained fluid in the subcutaneous and intermuscular tissues. The affected muscles usually have a characteristic sour odour. When the infection gains entrance to the tissues through shearing or castration wounds, the lesions are confined to the muscles and subcutaneous tissues in the vicinity of the infected wound. Not infrequently the lesions are relatively inconspicuous, though in other instances extensive areas of tissue may be involved.

Diagnosis of the disease may be confirmed by biological and bacteriological examinations of a specimen of discoloured musculature from a recently-dead animal. It is particularly important in the laboratory diagnosis of blackleg that the specimen should be as fresh as possible, as bacteria from the intestines quickly invade the carcass after death and may obscure the true causal agent of the mortality on bacteriological examination. Officers of the Livestock Division, if notified promptly when losses occur, can arrange for the collection of specimens for confirmatory laboratory diagnosis and can advise measures for the control of the disease.

Prevention by Vaccination

When heavy annual losses from the disease occur on a property after castration and docking of lambs or after lambing or shearing, animals can be protected very effectively by

vaccination carried out a fortnight before these procedures. The vaccine is supplied free from the Animal Research Station, Wallaceville, but as the vaccine is specific against blackleg it is essential that the diagnosis be confirmed by bacteriological examination conducted at the laboratory, so that where the mortality is severe losses may be prevented in the future.

It is particularly important in the control of blackleg that the carcasses of animals which die from the disease should be deeply buried or burnt. As the organisms are present in great numbers in the carcass and in discharges, failure to dispose of the carcass properly perpetuates the disease on the property and intensifies its incidence.

Y.F.C. Leadership Training Courses

A PROGRESSIVE movement among Young Farmers' Clubs is indicated in decisions recently made to institute leadership training courses to enable club members, especially chairmen and secretaries, to receive advice and instruction on matters relating to meeting procedure, secretarial practice, citizenship, and other subjects designed to improve the standard of leadership within the movement. Such a scheme, though ambitious, should materially further the aims of the federation, one of the objects outlined in the constitution being the development of the spirit of leadership among the youth of the community.

Tentatively discussed on a Dominion basis, the plan has been altered, and arrangements are being made for a course to be held at Lincoln College in the May vacation for the Canterbury Council, at Massey College in the May vacation for the Wellington Council, and at a suitable location yet to be decided for the Otago-Southland Council. In the Auckland Council area it seems probable that a number of district meetings will take the place of a combined course. As the courses are planned to occupy about four days, those Y.F.C. members attending them should gain helpful knowledge which should later be seen to advantage in rural life throughout New Zealand.

HARNESSE REPAIRS

There is a tendency for the farmer to regard harness repairs as beyond his scope, but there is no reason why he should not undertake many repair jobs. Information which will enable a farmer to master the techniques involved is given in Bulletin No. 221, "Harness Repairs," which is available from any office of the Department of Agriculture.

UNITED NATIONS 1948 APPEAL FOR CHILDREN



During May everyone will be asked: "Give a day . . . Save a child!" That means a day's wages from the worker, a day's salary from the professional man, and a day's profit from farm, factory, or business. Some may have to give less; others will want to give more. The entire gross proceeds of the appeal will be placed at the disposal of the United Nations and will be spent wholly within the framework of the United Nations on the needs of children.



Let your donation be all that your heart says you should give. Send it to the District Treasurer, United Nations Appeal for Children (care of the local mayor or county chairman), or direct to Dominion Headquarters, United Nations Appeal for Children, Box 650, Wellington.

Save the Children

THOUGH over two years have elapsed since the war ended, the wrack of devastation and suffering left in its wake still remains, an ever-present menace to the peace the Allies struggled so hard to attain. Famine is the foremost foe in Europe and Asia today. Two-thirds of the world's population are not getting enough to eat, and it is estimated that 460,000,000 children under 15 years of age are among those suffering from the dire effects of disease caused by undernourishment, and another 230,000,000 children are literally on the verge of starvation—truly the greatest tragedy of our time.

The alleviation of so much human misery is too stupendous a task for any country to undertake singly, but by the people of every peace-loving nation combining in practical action for this common cause the necessary funds for achieving this wonderful work for humanity will be abundantly available. The first person to propound the idea of instituting a United Nations Appeal for Children was Dr. Aake Ording, a member of the Norwegian delegation to the General Assembly of the United Nations, held in U.S.A.: "Shall this be a century of continued world wars and of final destruction? Or shall it be a Children's Century—a century of tremendous progress toward new standards of physical and spiritual prosperity? The children of the world, the weakest of us, are perhaps the wisest, for they call upon the best that is in us—our devotion and our courage. We showed both these qualities during five years of war. Do we now have the devotion, the courage, and the simple wisdom to save our next generation? I know we have."

His plea has not been made in vain. The Americans were swift to support the plan (President Truman gave it his official endorsement and enthusiastic encouragement; British Foreign Secretary Ernest Bevin wrote in like manner, Britain's effort being headed by the Lord Mayor of London), and now the campaign is being conducted on a world-wide scale. A strong national committee representing all sections of the community has been set up in New Zealand under the joint patronage of the Prime Minister and the Leader of the Opposition. The proceeds of the appeal will be spent wholly within the framework of the United Nations on the needs of children, no discrimination being made for colour, creed, or political beliefs.

Here is our opportunity to participate in the most far-reaching relief programme in history. Every one of us, whether we work in field or factory, shop or home, by donating a day's pay can directly help a starving child to survive. Surely it is a small sacrifice to make when confronted by such a supreme need. Doubtless many will wish to contribute considerably more than the amount asked; we should all give according to our means and the dictates of heart and conscience.

At the Dominion headquarters, Wellington, there is a file filled with photographs portraying the hapless child victims of modern warfare in its worst form. Here is a typical group of Polish refugees. One little boy lost a leg in the bombing of Frankfurt. They now live in a displaced persons camp. Janina and Danuta Cielak are two sisters whose father was killed in the Warsaw insurrection in 1944. Danuta, the smaller one, is minus a leg because of war injuries and she has outgrown the artificial limb with which she was fitted several years ago; at present there are no facilities for refitting her. Moreover, she has now contracted T.B. and Janina is suspected of being infected. Janusz Karpak and his sister Sofia are another pair of orphans; they come from Pensk, Poland, and their parents died in exile in Germany. (The total number of Polish orphans is placed at 200,000.) At the Sarajevo Hospital a wraith-like Yugoslav woman brings a toddler to Dr. Eleanor Singer for examination. The child is so emaciated that his skin hangs in bulging wrinkles on his body and lower limbs.

The plight of the babies of Moravia is equally pitiful, for the few clinics such as the Masaryk Institute at Moravska can cater for only a limited percentage of the patients requiring special treatment. Though three months of age, the puny infant the nurse holds so carefully is no bigger than a new-born baby. The four-month-old daughter of a dead partisan commander mother regards the camera with a desolate droop of her underlip



and her tiny hands clasped tightly in front of her. A meningitis case lies motionless in her cot, her head hidden in bandages. Pictures from Prague show pathetically-thin Czech children and the accompanying report states that nearly half the juvenile population of Czechoslovakia is seriously malnourished.

Health conditions are deplorable in Austria. They are even worse in Greece; the lot of the occupants of overcrowded orphanages such as those at Salonika, Piræus, and Yannina is indeed in pleasant contrast to that of the ragged urchins roaming the streets. Rickets, scurvy, and tuberculosis are rife throughout Italy; in the poorer suburbs of the principal cities the supplementary midday meal served at the schools forms the main part of the youngsters' diet.

The most heart-rending photographs of all are of children who have suffered mutilation of arm or hand and have lost both eyes in bomb or mine explosions. Their faces are eloquent of the horrors they have experienced. (Salih Mlivo, from Bosnia, aged 13, and his sister are the sole survivors of a family of 11. Another sightless lad and a little, one-armed waif with wistfulness in every line of her remain unidentified.) A companion picture shows three young inmates of the Zemun Home for the Blind. One is reading braille; another rests the stump of his right arm on the desk beside him while he plays a left-handed game with wooden pegs on a board; and the badly-scarred boy in the centre smiles as he fingers an unfamiliar tool with his one good hand.

We in New Zealand, who have special organisations to look after the fatherless and assist the handicapped children in our midst, cannot ignore the claims of the countless orphaned and maimed children on the Continent for help and care. We who live in a fertile country where food is plentiful cannot refuse to share our abundance with those who are in danger of death from starvation. We take pride in the fact that our infant mortality rate is the lowest in the world; in most of the war-ravaged lands the rate has doubled and trebled. It is in our power to tip the balance in favour of life for the destitute children of Europe and the Far East.

Let us give generously and gladly that for millions of hungry children the Lord's Prayer will have a vital meaning and His kingdom of joy and peace may come on earth.

Many

WATCH OUT!

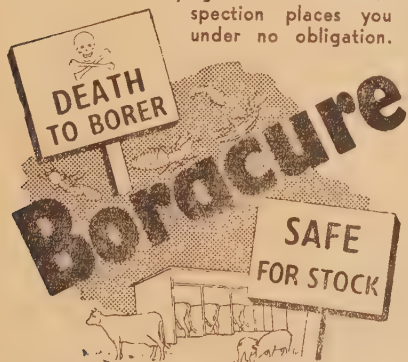


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★ **METHOD FOR SCONES:** Mix with milk, let stand for 12 minutes. Knead several times. Bake in 450° oven.

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PREPARING AND ADAPTING DRESSMAKING PATTERNS

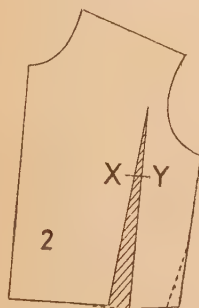
AS fabrics today are so expensive, the home dressmaker will find it worth while to pay more attention to making the best use of the material she buys. Correct use of the pattern is of prime importance in achieving this end, and this article by Edith G. McNab, Rural Sociologist, Dunedin, explains how patterns should be prepared before cutting the material and how they can be adapted to suit individual needs.

ALL makes of commercial patterns vary, and cheap patterns are not necessarily the best bargain. The better makes of patterns are cut to fit average sizes, and may include instructions for use, diagrams showing the layout for cutting, and a suggested method of construction for the garment. Each piece of a reliable make of pattern will be easily recognised, and will be marked plainly to show the position of the straight grain, seams, darts, pleats, or gathers. Patterns are bought according to bust size, for usually it is easier to alter the size of the skirt than the top of a dress.

Preparing the Pattern Pieces.

Before placing the pattern on the material study the pattern itself and any directions given with it. Time spent at this stage is time saved later, and the possibility of making mistakes is reduced. Smooth the pieces of pattern out. If they are badly crumpled, they may be ironed with a cool iron, though care must be taken that the iron is not hot enough to scorch the paper. Read the instructions carefully, finding out what all the marks mean (different manufacturers use different systems of marking)—whether or not seams and hems are allowed, and if so, the amount of each allowance—and what body measurements the pattern size corresponds to. If a pattern provides a choice of two styles, sort out the pieces needed for the style preferred, and put all other

pieces away. Each piece kept out can then be examined carefully and any alterations made.



Enlarging a blouse front. Cut from the waistline toward the shoulder. The amount XY is added to the bust. If the waistline is increased too much, the side seam may be trimmed as shown by the dotted line.

on the pattern by perforations should have these joined up and the line produced to both ends of the pattern by placing a yardstick along the perforations and drawing a pencil along its edge. The straight-grain line should always be ruled the full length of the pattern if this has not been done by the manufacturer. The value of this long line will be seen when placing the pattern on the material.

Checking Measurements.

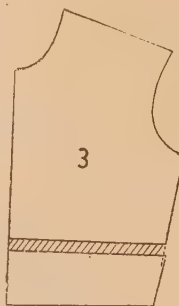
Some measurements will be given with the pattern, but even these must be checked with the measurements of the person for whom the garment is being made. Measurements given on the envelope do not always correspond with the actual measurements of the pattern. The cheaper patterns may be cut to measurements which are not average at all, and therefore they need special care in checking for size. Moreover, few women are exactly average in all proportions. Width measurement must always allow a certain amount of "ease" to provide for free movement without pulling of the

seams of a garment. Usually, about 1 to 2 in. of extra width is allowed in the front of a blouse for ease and about 1 in. across the back. Ease of from 2 to 3 in. must be allowed in a skirt around the hips so that the wearer may sit in the garment without straining it or pulling it out of shape. Free arm movements in sleeves are allowed by having 1½ in. of ease above the elbow and 1 in. below. In addition to allowing for ease, in checking width measurements take into account whether or not seams have been allowed for; for example, a ½ in. seam on each side adds 1 in. to the measurement. Subtract this to arrive at the actual width.

Check the length measurements also of the bodice, sleeves, and skirt. If a skirt pattern is too long (taking the hem allowance into account), material may be saved by shortening the pattern before cutting; if the pattern is too short, it is important to discover the fact before, not after, cutting. Facings are always very slightly smaller than the corresponding parts of the garment.

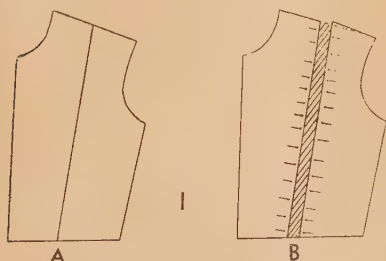
Fitting Individual Measurements.

If a pattern is too small in the bust measurement, the extra width necessary will have to be divided between the front and back of the pattern, but the amounts will depend on the figure. For a well-developed bust more may be added to the front than the back, and for a round-shouldered person more may have to be added to the back than the front. To increase the size the pattern piece is cut in two, and the two sections are spread apart for the required distance. A strip of paper can be pinned in to hold the two sections in position, or strips of gummed paper may be used. Cutting and spreading are done in the position which least disturbs the seam-lines and shape of the pattern. Fig. 1 shows where to cut and spread the bodice front pattern. If the length of the front shoulder seam is thus increased too much, a deeper shoulder dart must



Cutting and spreading to lengthen a blouse front. Keep the centre front line straight and straighten the side seam if necessary.

be taken or more gathers put in. Fig. 2 shows how the bodice width can be increased without altering the shoulder length. Increase the back width by similar cutting and spreading. Test the length measurements of the bodice also, and lengthen it if required by cutting it across and spreading a few inches above the waistline (Fig. 3). Lengthen the front and the back by the same



Increasing the width of a blouse front. A—The line where the pattern is to be cut. B—The two pieces spread apart and an extra strip of paper pinned in. The shoulder seam is straightened by cutting on the dotted line.

ADAPTING PATTERNS TO INDIVIDUAL NEEDS

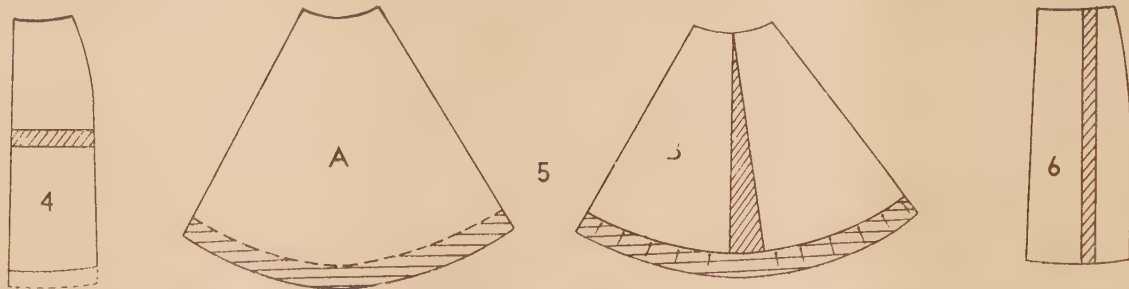


Fig. 4—Lengthening a skirt. Add half the required amount by cutting and spreading midway between waist and hem-line, and add the other half at the hem-line. Keep the centre front or back in a straight line. Fig. 5—Shortening a flared skirt. A—Cut off the excess, as shown by the dotted line. B—Cut from hem to waist, spread to fit the cut-off part of the hem-line, and pin together. Do not disturb the position of the straight grain. Fig. 6—Enlarging the waist and hip. Cut from hem to waist and spread.

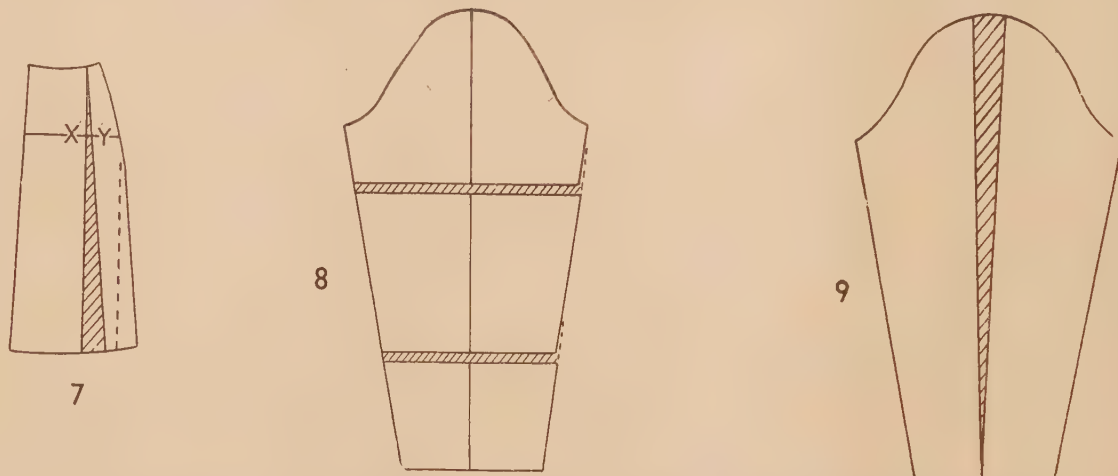


Fig. 7—Increasing the hip, but not the waist. Cut from hem to waist, spread at the hip for the required amount XY, and taper to the waistline. If this adds too much flare to the skirt, the side seam below the hip-line can be trimmed off as shown by the dotted line. Fig. 8—Lengthening a sleeve. Cut and spread equal amounts above and below the elbow. Keep the straight-grain line in the correct position, adjusting at the side seam-lines if necessary. Fig. 9—Widening a sleeve. Cut from the highest point of the sleeve cap to the wrist, and spread, tapering to the wrist as shown if no increase in wrist size is desired. If the wrist has to be enlarged, spread at the wrist. This method increases the amount of fullness at the top of the sleeve.

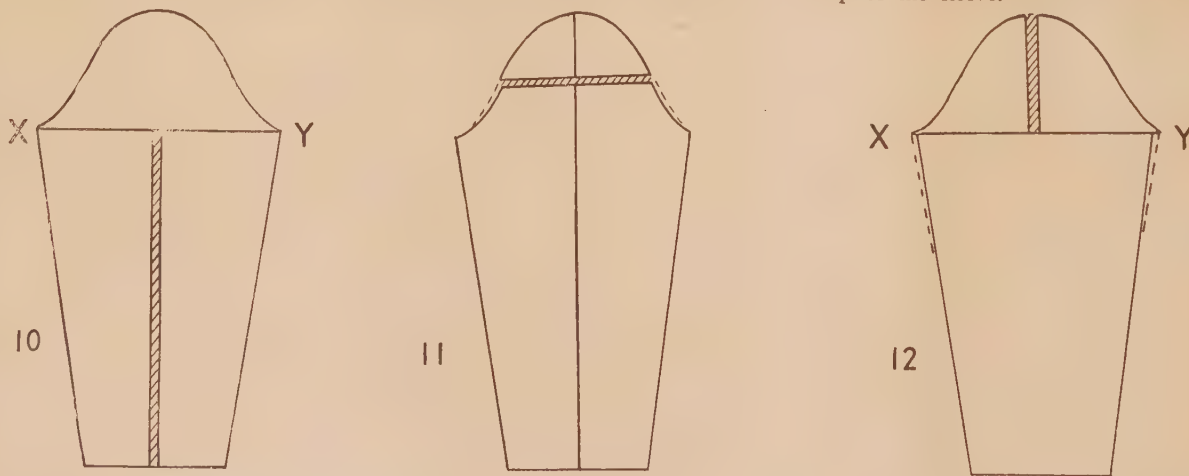


Fig. 10—Widening a sleeve without altering the fit of the sleeve over the shoulder. Cut off the sleeve cap on the line XY. Cut and spread the lower part of the sleeve and replace the sleeve cap. Match the notches as usual in fitting the sleeve into the armhole and slightly ease the under-arm part of the sleeves if required. Fig. 11—Adding to the height of the sleeve cap. Cut and spread as shown, keeping the straight-grain line in position and drawing a smooth curve on each side, as indicated by the dotted lines. Fig. 12—Widening the sleeve cap. Cut off the sleeve cap on the line XY and cut and spread the cap. Rejoin the cap to the sleeve and adjust the side seams as shown by the dotted lines.

amount so that the under-arm seams are still equal in length. Reducing width or length is done in the same position on the pattern as that shown for increasing the size, by folding in a tuck or cutting and overlapping the cut edges of the pieces.

Most skirt patterns are shortened or lengthened by making half the adjustment about midway between the waist and the hem and the other half at the hem-line, as shown in Fig. 4. If the skirt is flared, shorten it by cutting off the required amount at the hem, but as this will make the circumference of the hem-line smaller, it is necessary to cut the pattern lengthwise and spread it to fit the piece cut off. This piece can be pinned to the foot of the skirt (Fig. 5.). Lengthen a flared skirt by adding whatever is necessary at the hem-line.

To increase the waist and hip width of the skirt cut lengthwise and spread, as shown in Fig. 6. Any increase of the waist on the skirt pattern must be matched by an increase in the waist-line of the bodice. To increase the hip but not the waist width, cut the pattern from the hem almost to the

waist, and spread it apart for the required amount at the hip-line (7 to 10in. below the waist). This will add some flare to the pattern which may be left in or taken off the side seam below the hip-line (Fig. 7).

Check the inner and outer arm measurements of the sleeve. The inner arm measurement corresponds to the seam-line generally, and the outer arm measurement always corresponds to the length from the point where the sleeve meets the shoulder seam to the wrist on or parallel to the straight-grain line. Shorten or lengthen the sleeve at two places, one above and the other below the elbow, as shown in Fig. 8. Add width to the sleeve by cutting lengthwise and spreading. If the wrist measurement is correct, taper the amount of spreading to give none at the wrist (Fig. 9). If no alteration to the top of the sleeve over the shoulder is wanted, follow Fig. 10. If the sleeve cap is too short or too narrow, it can be lengthened or widened by the method shown in Figs. 11 and 12.

Laying Out Pattern on Material.

When all alterations have been made the pattern can be placed on the material. The fabric should be pressed, with one end cut straight along a crosswise thread. Layout diagrams given with the pattern may be used, but sometimes it is possible to work out a more economical plan.

If the material has a nap or a one-way design, care must be taken to arrange the pattern so that the nap or design lies in the same direction on all pieces. The design must also be the right way up. When the material has a check or stripe care must also be taken, and in addition, the pattern pieces must be placed so that the stripes or checks match at the seams. Stripes or checks can provide a pleasing design for some styles if arranged to run in different directions, but the directions in which the stripes will run when the garment is worn must be carefully decided and planned in laying out the pattern. Avoid materials with stripes or checks **printed** on rather than woven into the material, because if the stripes are not printed on the straight grain, it is most difficult and sometimes impossible to produce a successful garment.

All pieces should be placed on the material before any cutting is done. The material may be folded in half lengthwise by matching the selvages, or it may be folded over just enough to take the pieces of pattern, measuring from the selvedge to the fold to make sure the fold is the same depth everywhere, and thus ensuring that the fold is on the straight grain. The right side is often folded inward so that chalk marks are made on the wrong side of the fabric.

The biggest pieces of pattern are laid first, with the widest end of the first piece to the straightened end of the material. Fit the smaller pieces in wherever space offers, keeping all pieces on the lengthwise straight grain unless directed otherwise. Test the straight grain for each piece by making sure the distance from the straight-grain line to the selvedge is the same for the whole length of the piece. When all the pieces have been fitted on the material pin them in place, using plenty of pins and putting them in at right angles to the edges of the pattern and diagonally at the corners. A securely-pinned pattern helps to ensure accurate cutting.

When cutting is finished transfer all marks needed for construction from the pattern to the material, and leave each piece of pattern with the corresponding section of the garment until it is needed.

Shrinking of Materials Before Cutting Out

MANY materials shrink on wetting, and unless a fabric is guaranteed shrink-proof or it is known from experience not to shrink much, it is safer to shrink it before cutting out, especially if the garment is to be washed. No one would care to find a garment on which she had spent much time and trouble shrunken after its first wetting in a shower of rain or in the wash. Most materials for everyday wear can be pre-shrunk quite safely. When fabric is bought it should be ascertained whether the material is washable and the colour fast. Materials for afternoon or evening dresses should be handled carefully, for they may have novelty finishes which will not stand washing or shrinking. If there is any doubt, try shrinking a small piece of the material first.

To shrink cotton, linen, or rayon materials wet them in cold or lukewarm water. Do not wring the material by hand or put it through a wringer, but hang it on the line, taking care to have it hanging straight, and allow it to drip. It depends on the material whether it should be dried completely before ironing or whether it should be ironed while still damp. In either case, before ironing spread it out singly, with no fold, and make sure that the threads run straight up and down and straight across the fabric. If these lengthwise and crosswise threads are not at right angles to each other, pull the material on the bias until the threads come into position.

To shrink wool wring out a sheet tightly in cold water, spread it out, place the woollen material on it in a single layer, and roll it up so that the outer layer is formed of the damp sheeting. Leave it overnight, then take out the woollen material, and press it with cloth and iron on the wrong side until the material is nearly dry. Lift up the iron and put it down in a new place instead of pushing it backward and forward over the material, as movement and pressure at the same time will "felt" the wool fibres together and shrink the fabric too much. The aim in shrinking is just to counteract the extra tension put on the material in the stretching of the tentering process in the factory. Do not dry it completely under the iron, as this will tend to develop a shine on the material. Leave it flat until quite dry, or hang it over a rail or the top of a door, protecting it by placing paper between the door and the fabric. As with cotton or rayon, take care to keep the grain straight during the shrinking process.

Though the shrinking of wool takes some time and trouble, it is well worth while; otherwise the garment may shrink when it is washed or at the seams when they are pressed.

PACKING PARCELS FOR OVERSEAS

THERE is not far to seek to find very great need in the world today, and in the packing of parcels for overseas Eirene Unwin, Rural Sociologist, Dunedin, suggests that much that will be infinitely more worthwhile and rewarding than could have been dreamed will be found. The extra trouble of seeking names and addresses of people in need in other lands to whom personally-packed parcels may be sent direct is recommended as a means toward breaking down barriers of strife and hatred that still remain.

THE following practical advice on the contents and packing of overseas parcels will be found of great assistance to those who wish to get the most into their parcels within the weight limits, and directions are given on sealing, addressing, and dispatching to ensure safe delivery with the contents in good order.

Those who do not know names and addresses of people to whom to send personal parcels may send through CORSO and the Red Cross. CORSO bears the cost of transport of gifts beyond New Zealand.

What to Send

Food: Almost any tinned food is welcome, especially meat, cheese, fruit, jam, fruit pulp, vegetables (to Europe rather than England), honey, golden syrup, fat, puddings, oysters, and soups.

Dry foods such as custard powder, dried milk, glucose, jelly crystals, and packet soups.

Foods put in tins at home—biscuits (not too brittle), shortbread, fruit cakes, home-rendered and clarified fat, with or without very lightly-cooked bacon in it, dried fruits of all descriptions, shelled nuts, chocolate, shredded suet, and honey and golden syrup (transferred from carton to a watertight tin).

Soap: Toilet, household, and laundry soap, and soap powders and soap flakes.

No tins should be sent unsoldered.

Cigarettes and tobacco.

Clothing: To Europe and China—Any used clothing, including shoes (particularly children's) that are clean and mended and are still wearable. Warm clothing is probably the more valuable, but any is acceptable. New clothing. Knitting wool, woollen pieces, thread, darning thread, tape, pins, needles, knitting needles. To China particularly: As well as all the above, cotton or linen pieces for bandages or medical dressings, clothing repair kits, pearly and trouser buttons, sanitary towels.

To England, Europe, and China: Knitted garments, socks and gloves, baby clothes and bedding, towels, tea towels, new material (pyjama cloth,

flannel, woollen or art wool, etc., as well as cottons and silks and linens).

Educational equipment and stationery: Particularly for Greece and Central Europe and China: Paper, exercise books, pencils, pencil sharpeners, rubbers; coloured crayons and chalks, blackboards; materials for handwork—pieces of linen, bright-coloured wool and cottons for embroidery; books (not books discarded from your own library, but ones you have enjoyed and expect other people to enjoy), modern up-to-date text books. (Probably it would be better to send books to CORSO rather than direct, as they are more likely to know where they will be of most value and where books printed in English can be used.)

Toys: Particularly soft and cuddly ones; sports equipment such as soft balls, tennis balls, footballs (preferably soccer), bats, deck tennis rings or nets, drawing and design kits, woodwork and handicraft kits; good manipulative toys like those used at kindergartens and instructional play material like that used in the primers. (Again, such are better sent to CORSO.)

Medical supplies: Materials for bandages and dressings; dressing pads 3in. to 15in. square; calico roll; triangular bandages, T bandages, many-tailed bandages; binders; gauze; swabs; eye-pads; eye-bandages; sheeting and blankets; cottonwool. Relief supply kits for refugees and displaced persons in China would be best sent to CORSO.

Nucleus: Bowl and/or mug (preferably unbreakable) with ring or handle for attaching to belt; spoon; comb; soap; towel; toothbrush; dentifrice; aspirin; quinine if obtainable; hard sweets if available (in tins); pad, pencil; 18in. square of cotton cloth.

Tobacco and cigarette papers might be included for men and sanitary towels and cigarettes for women.

Camp kits: Needles, bandages, candles, antiseptics, facecloths, thread, string, pencils, writing blocks, crayons, singlets, hose (preferably knee-length, cotton or wool).

Family kits: Clothing repair sets, first-aid kits, insecticide, ointment, or salve. Supplies of mending equipment as listed under clothing.

Finally, gifts of money are always welcome at CORSO headquarters to assist the organisation's humanitarian work.

This long list of wants should not be allowed to alarm or discourage prospective packers of parcels. It has been made as complete as possible to give plenty of choice. It will be fairly obvious which of the items suggested should be sent to CORSO and which could be well packed up at home. Food, clothing, soap, and stationery could be packed at home and sent direct. Toys, medical supplies, sports equipment, and educational supplies are probably best sent to CORSO, at least until a direct contact has been built up and the particular need of individuals is known.

Correspondence should be addressed or money gifts sent to the Secretary, CORSO, Box 11, Government Buildings P.O., Wellington. Goods should be sent to CORSO, 100 Lambton Quay, Wellington, or sent to the nearest Red Cross centre or sub-centre marked CORSO, and contents of packages should be stated, as toys, medical supplies, etc. When goods are sent direct to CORSO the secretary should be advised of forwarding date, contents of cases, markings of cases, and any request about destination.

Distribution of goods sent to CORSO is divided mainly between Greece and China. Parcels sent to CORSO need not be packed ready for sending overseas, as they have to be repacked into strong cases. CORSO does not post individual parcels, but packs all goods in cases, which are sent as freight.

Even one article sent from all the above list will be of value somewhere to some person, so there should be no hesitation about sending because a contribution seems small.

How to Send

As experience is gained in the packing of parcels for overseas a great many practical improvements in methods may be made. Following are some useful hints already learnt by one who has had experience in preparing the contents of and packing some 200 parcels ranging in weight from 5 to 22lb.

1. Bought tinned foods need no further preparation.

2. Honey, golden syrup, and fat may be melted if necessary and poured into watertight tins, with well-fitting press-in lids. These should then be soldered on all round to make a watertight join. (Note: Baking powder tins are usually not watertight. Old syrup or honey tins are; dried milk tins usually are, but should be tested first. A press-in lid is much the easiest to solder afterward.) When

putting fat in a tin at least $\frac{1}{2}$ in., preferably more, should be left empty at the top. The reason for this is that with the heat of the soldering iron the fat or honey melts, and, if the tin is too full, will ooze through under the lid, making it almost impossible to solder completely.

3. Honey or golden syrup should not be sent in the cardboard cartons in which it is sold. Even solid honey will melt in the Tropics, and parcels are liable to receive very rough treatment before delivery.

4. Home-made biscuits should if possible be made with butter, not dripping, as dripping biscuits are liable to be more crumbly, and so are in grave danger of arriving as crumbs instead of biscuits! To make sure biscuits are thoroughly dry they may be turned upside down when cooked and returned to the oven this way up for a few minutes. This ensures that a small moist patch does not remain in the middle of the bottom of the biscuits. Biscuits should be packed closely in tins lined with greaseproof paper, and any spaces stuffed with crumpled paper so that the biscuits are quite tight and will not rattle. Be sure they are quite cold before packing. If the biscuits are rolled out and cut to shape they should be cut with a tin a little smaller than that into which they are going to be packed, allowing for spreading and for lining of the tin, and then there will be no waste space when they are packed one above the other into the tin. If cutting out rounds of biscuit dough to make biscuits to fit neatly into a round tin means that the biscuits will be too large, the circles may be cut in halves or thirds before baking. This applies to shortbread too. Tins of biscuits

... PACKING PARCELS FOR OVERSEAS

need not be soldered up; adhesive plaster is quite sufficient. It is a good idea to warm the plaster first, sticky side up, in front of a heater or on the top of a stove.

5. Home-made cakes should be baked in the tins in which they are to be sent, lined with two or three layers of paper, only the inside one being greased. When they are cooked remove all papers except the one adhering to the cake, wash and dry the tins, reline with greaseproof paper, and return the cake to the tin. The tin should not be more than half filled with mixture, or the cake will rise above the top edge and the lid will not go on. All the space between the top of the cooked cake and the lid may be filled with dried fruit, but there should be a layer of greaseproof paper between these and the tin, because if it is a long time before the parcel is delivered the fruit may corrode the tin if in direct contact with it.

6. If tins that have had jam or soup or meat in them have been opened cleanly with a smooth-finish tin-opener and the lid removed completely and retained, they can be used again for packing food, especially dry foods or biscuits. Round meat tins and fruit tins especially make excellent containers for fruit cakes of about 2lb. If the tin is packed level with the top and paper spread across and pushed down the edges with a blunt knife, the lid may be resoldered in place after a little practice with a soldering iron. This is not as difficult as it sounds, particularly if a good flux is used. Alternatively two similar tightly-packed tins may be placed

mouth to mouth and soldered together. If they are held close in position and a drop of solder put on the junction on one side, they may then be rolled over and another drop put on the other side; then, again with the help of flux, the solder may be run right around the join.

7. When getting fat for rendering, "soft," "cod," or "brisket" fat, not ordinary suet, should be asked for. This renders down to a soft, creamy fat which is much better for baking with than hard suet. Any meat or very skinny or gristly bits should be cut away and the fat put through the mincer with the coarsest attachment. This is better than cutting it up, and less tedious. The minced fat can be put in a meat tin or pie-dish—something fairly shallow—and melted in a cool oven. The liquid should be strained off straight into tested tins or into a jug so that it may be poured cleanly into the tins later, and the fat returned to the oven till no more liquid will come from it. The browned parts should be crushed with a fork each time the fat is taken from the oven.

Bacon to be sent in the fat should be only very lightly cooked for a few minutes on each side, not even till the fat is properly clear. It should then be placed in the tin and the liquid fat poured over it, a little at a time, and the bacon moved about so that all air bubbles escape. The tin should not be too full of fat and the bacon should be covered, or almost completely so.

If fat is spilt on the rim of the tin it must be scraped and washed off, using a hot, damp, soapy cloth, and taking care not to get any water into the fat. If fat is left on the rim the solder will not stick to it properly.

8. Chocolate should be packed in tins and soldered or fastened with adhesive tape.

9. Eggs should not be sent in fat. They do not necessarily travel well, even if the parcel is being taken by a friend and being put in the ship's refrigerator.

10. Dried milk, jelly crystals, packet soups, custard powder, and soap powder and flakes can all be sent in the packets in which they are bought. It is as well not to pack soaps and untinned food side by side, as the smell of the soap is inclined to penetrate the food and taint it. It is advisable to wrap up the bigger packets, especially soap powders and flakes and dried buttermilk, in paper or cotton cloth, as the results are somewhat disastrous should the packet get broken and the contents spread throughout the parcel.

11. A 22lb. parcel (the maximum at present allowed to be sent to England).

BOOK REVIEW

"The Sparkling Waters of Whakatipu": F. Mackenzie

THIS being centennial year for Otago, it is particularly appropriate that the story of one of the loveliest and most romantic parts of the province—Lake Wakatipu—has recently been commemorated in book form. Furthermore, most people will take pleasure in the fact that the history has been compiled by a local resident, Mrs. John Mackenzie, of Walter Peak Station. Mrs. Mackenzie's literary qualifications and her keen interest in all matters pertaining to the development of the Lake district rendered her well suited to this task.

The chapters on the early Maori inhabitants and the naming of the principal peaks and rivers form an admirable introduction to the saga of the pioneer squatters. Though some of them were undoubtedly failures from a financial standpoint, they bequeathed

an invaluable heritage of courage and endurance to their descendants. Florence Mackenzie depicts with dramatic skill the hardships and difficulties encountered by these gallant settlers, and she does not neglect to describe the small domestic details which are of such interest to feminine readers. The story of the Von Tunzelman family, in particular, is told most appealingly, and her account of the gold boom is enriched by vivid little cameos of the outstanding characters of the period, but it is in writing of high-country farming that she is most eloquent. She also deals fully with such topics as transport, entertainment, the first newspaper, the establishment of the churches, civic affairs, and the like, and invests them with human interest.

Alan Mulgan, O.B.E., has contributed a foreword to "The Sparkling Waters of Whakatipu." The book is illustrated and includes a map showing the location of the first runs at Wakatipu.

—A. H. and A. W. Reed, 10s, 6d.

PACKING PARCELS FOR OVERSEAS . . .

can be very satisfactorily packed in a quarter-sized fruit case—the sort in which plums, etc., are sold. This should be lined with paper or with towels or sheets, etc., that may be included in the parcel. If a thick cardboard carton is used instead of a wooden box, a thick lining, such as a sheet, would be an advantage.

Contents should be arranged carefully, remembering the following:—

(a) Soap should not be put next untinned food.

(b) Small or sharp-edged tins should not be put against the sides of large cardboard packets, as these are liable to get pushed into and to break the packet should the parcel be badly knocked about.

(c) The weights of each tin or packet packed should be checked and allowance made for the weight of the box, lining, lid, and sackcloth wrap-

ping to keep the total weight below 22lb. Contents should also be listed for Customs declaration.

(d) Odd corners may be filled up with small pieces of bar soap cut to fit and wrapped in greaseproof paper, or, if this will make the parcel too heavy, with skeins of wool, small knitted articles, etc.

When the box is level full and of the correct weight the lid may be nailed on and the box sewn up in a piece of sugarbag or manure bag, using fine, strong string and a bag needle. The string with which sugarbags are machined is excellent. This is nearly always machined in a chain stitch, and can be pulled undone if unpicking is begun from the right end and a little patience used till the thread comes undone. Small stitches, using many back stitches, are advisable in covering the box.

12. If a smaller parcel is being packed—11lb. is still the maximum for dispatch to some places in Europe—it is not necessary to use a box, especially if there are plenty of clothes or other softgoods to use as wrapping. It is well to plan the placing of various tins and packets to get the parcel as regularly shaped as possible, remembering that soap and sharp-edged tins must be put where they offer no potential damage to the rest of the contents. Where two tins touch, a solidier parcel and easier wrapping are obtained if the tins are fixed in position with a drop of solder. Paper and paint coverings must be scraped off first where the solder is to be applied. Packets of goods should be wrapped in with the tins, using magazine pages or a whole magazine opened out as wrapping. (There is good scope in the selection of literature used as wrapping for providing interesting reading for the recipient of the parcel.) At this stage the parcel should be tied tightly with string, and then wrapped again in the clothing, sheets, or wool to be sent, and finally wrapped and sewn in calico, flour bag, or other similar material. If this final wrapping is used liberally, it may provide enough material for the recipient of the parcel to make up into tea towels.

13. The name and address of the recipient should be written clearly and in large letters in indelible pencil or Indian ink on the wrapping, and also the sender's name and address, clear but not so large, and Customs forms should be filled in. It is a good idea to gum labels before applying, especially to sacking, as the adhesive surface already provided is not always sufficient.

The parcel is now ready for posting, and on the way home from its dispatch it is a good idea to buy more food or clothing or soap ready for the next parcel!

A Woollen Duck for a Small Child

A CUDDLY woollen duck likely to be favourite in any small child's array of soft toys can be made in a few hours. The materials needed are 1oz. of white three-ply wool, a pair of No. 12 knitting needles, a small piece of orange felt, $4\frac{1}{2}$ in. of millinery wire, a curtain ring, a crochet hook, and cotton wool.

Abbreviations used in the pattern are: K. = knit; p. = purl; sts. = stitches; tog. = together; rep. = repeat; inc. = increase; dec. = decrease; m. st. = moss stitch.

Wings

Using the wool double, cast on 11 sts. and work 2 rows in m. st. Third row.—M. st. to last 2 sts., take 2 tog. Fourth row.—M. st. Fifth row.—As third. Sixth row.—M. st. 7, turn and work back. Eighth row.—M. st. 5, turn and work back. Tenth row.—M. st. 3, turn and work back. Twelfth row.—M. st. across all sts. Now dec. 1 st. at both ends of next and every fourth row until 3 sts. remain. Work 3 rows, then take 3 tog. and fasten off.

Body

Using the wool double, cast on 5 sts. and m. st. 1 row. Second row.—Work twice into first st., m. st. to last st., work twice into this st. Rep. last row 4 times more. Seventh row.—M. st. to last st. Work twice into this st. Eighth row.—M. st. Rep. last 2 rows 4 times. Seventeenth row.—Cast off 3 for tail, m. st. to last st., work twice into this st. Eighteenth row.—M. st. Nineteenth row.—M. st. to last st., work twice into this st. Twentieth row.—M. st. Twenty-first row.—Take 2 tog., m. st. to last st., work twice into this st. Rep. last 4 rows once more, then work 3 rows without shaping. Twenty-ninth row.—Take 2 tog., m. st. to end. Rep. last 4 rows twice. Thirty-eighth row.—Take 2 tog., m. st. to end. Thirty-ninth row.—M. st. Fortieth row.—Take 2 tog., m. st. to end. Forty-first row.—Take 2 tog., m. st. to end. Rep. last 4 rows twice. Fiftieth row.—Take 2 tog., m. st. to end. Fifty-first



row.—M. st. to last 2 sts., take 2 tog. Fifty-second row.—Take 2 tog., m. st. to end. Fifty-third row.—Work twice into first st., m. st. to end. Fifty-fourth row.—M. st. Fifty-fifth row.—Work twice into first st., m. st. to last st., work twice into this st. Fifty-sixth row.—Work twice into first st., m. st. to end. Rep. last 2 rows once more, then work 4 rows without shaping. Sixty-first row.—Take 2 tog., m. st. to last 2 sts., take 2 tog. Sixty-second row.—M. st. Rep. last 2 rows once. Sixty-third row.—As sixty-first row. Cast off.

Make another section in the same way.

Make Up

Join the two body sections, stuffing them very firmly as they are sewn. Sew the wings to the body. Cut the bill in felt and sew it to the face. Sew on eyes made from small circles of felt over which are set smaller circles of white material. Attach each to the head with a french knot in black.

Push wire through the lower part of the body and secure it. Fold back the ends to form triangles for feet. Cover legs and feet with felt.

Tie a ribbon round the neck and to this sew a 6 in. chain. Cover the ring with double crochet and sew it to the other end of the chain.

Methods of Feeding the Flower Border

IN this final article on the rules of good flower gardening, J. P. Hudson, Horticulturist, Welling-ton, deals with the fifth rule, "Feed the flower border," which he describes as perhaps the most important of all, but also the one about which least accurate information is available and the hardest about which to give sound advice.

WITH ever-increasing knowledge, ornamental horticulture (flower gardening) seems fast to be becoming a science, but it first developed as an art. In the seventeenth, eighteenth, and nineteenth centuries the arts depended largely on the patronage of the well-to-do, who became the patrons of the new art of horticulture. The gardeners of those days, men of great experience and wide knowledge of plants, were well aware of the need to feed the flower border, as a perusal of any old gardening book will show, but they were fortunate in always having to hand a limitless supply of plant food, in the form of stable manure and household slops from the large establishments which they served.

This manure was often used first in making up hot beds or for growing mushrooms, and was not used on the flower borders until its richness was partly spent and it had become a mild, friable, sweet-smelling form of humus. Coupled with the use of wood ashes, this gave first-class results and the expert plantsmen of those days produced displays of flowers that probably have never been excelled and the like of which are rarely seen now.

The Problem Today

The picture in the average home garden is very different today. Horse manure is something read about but seldom seen. Household slops (in the eighteenth-century meaning of the word) go down the drain, but the home gardener is offered instead a bewildering variety of chemicals, some of which are sold as fertilisers with neither a stated chemical analysis nor instructions for their proper use.

The old timers did not need to worry much about chemical names because, luckily for them, their staple manure contained the chemicals that their plants required. The modern gardener is less fortunate in supplies of animal manure, but has access to a great fund of new knowledge about soils and plants, an understanding of which can lead to successful gardening and fewer failures. No wonder gardening is more interesting than ever before and is becoming no less than a national hobby.

Growth stems from the soil, which is equally quick to reward correct treatment or revenge abuse. Correct soil management is the basis of good flower growing, and the aspect of management now being considered is the addition of materials to the soil to feed the flower border. Materials which may be added to soil in which flowers are to be grown can be classified into three groups—organic matter, plant foods, and lime (which is not always wanted and will be dealt with in a separate article). For convenience the organic matter (humus) and plant foods will be discussed separately, though they are not entirely independent of each other.

Organic Matter

So much is said and written about the need for continuously supplying organic matter to the soil that the subject is likely to become stale, but it is worth emphasising again that trying to grow good displays of flowers in a soil lacking in humus is hopeless. Much New Zealand soil was very rich in humus when it was first taken into cultivation out of the bush, but that humus has long since disappeared.



[Douglas Elliott photo.]

Pot marigolds are among the most useful of border plants, as they flower for a long time and make a bright display of colour. Though individual plants will flower for a year or more if dead heads are picked off regularly, the flowers gradually become smaller and it is better to sow or plant afresh every few months and pull the old plants out as the new ones come into flower.

On well-farmed land, however, efficient methods have been devised for replacing the original humus and so maintaining or even increasing the fertility of the soil.

When fertile agricultural land is subdivided for housing the householder starts growing flowers on a soil well supplied with humus, and usually is pleased with the way things grow at first. But it is in the nature of humus to decay and disappear altogether in time, leaving the soil poorer in fertility and structure and less able to carry a crop unless the humus is replaced.

Importance of Compost

In flower borders, where fading plant remains are continually taken away for the sake of tidiness and little of the crop finds its way back into the soil, the humus content very rapidly falls away unless it is replaced. Green crops cannot be grown in the flower borders to supply bulky organic matter to dig in to the soil, and the only source of replacement in most home gardens is the compost heap.

No gardener can afford to be without a compost heap, through which the most efficient use can be made of all available organic matter and household scraps. By careful composting, the humus content of garden soils can be maintained at a reasonable level for flower growing.

Home gardeners can often make enough compost from their own resources to give the whole of the flower borders and vegetable garden a useful dressing each year, but even now, when animal manure is hard to obtain, it is possible to buy other useful forms of organic matter. Consideration of these sources is worth while, especially for old gardens where constant cropping has led to lowered fertility. The preparation of compost for application to the home garden was dealt with comprehensively in an article by A. McKechnie on page 237 of last month's "Journal."

Other Sources of Humus

Sawdust is a form of organic matter which for long was neglected, though there is plenty of it lying about the sites of old sawmills. Recently it has been giving excellent

FEEDING THE FLOWER BORDER . . .

results when used as a mulch between rhododendrons, azaleas, and other shrubs, especially on heavy clay soils. but that is a rather special case, as these shrubs originated in forest surroundings, where the soil contains a great deal of woody forest litter.

As a plant food the ingredients of sawdusts are very badly balanced, and a dressing of raw sawdust applied to the general flower border could easily do more harm than good. The main disadvantage is that its use leads to an acute temporary locking up of the soil nitrogen. That in turn prevents plants from growing properly unless their nitrogen starvation is overcome by an adequate dressing of nitrogenous fertiliser.

In a sample of old, dark-brown sawdust recently analysed the nitrogen deficiency was so marked that 12½ lb. of sulphate of ammonia would have been needed to each 100 lb. of sawdust to make it safe to use as a garden mulch. Without some additional nitrogen the sawdust would have checked the growth of most flowering plants, except for those already referred to, and might have caused disaster in the border if applied in spring or during the growing season. Yet the quantity of sulphate of ammonia involved

would itself introduce the opposite risk of making flowers grow too soft and sappy when the sawdust ultimately rotted away and the nitrogen came back into circulation in the soil.

There would be less danger if sawdust was applied in autumn or winter, but it seems that the best way of using sawdust is to put it in layers on the compost heap, water it well, and sprinkle each layer with a generous dressing of some strongly-nitrogenous material such as poultry manure, sulphate of ammonia, or dried blood. With this addition, and mixed with other ingredients of the compost heap, a certain amount of sawdust can make a useful contribution to the humus supply of the garden.

Straw, hay, dry leaves, and stack bottom are also useful forms of organic matter that are sometimes available to the home gardener. The best way of using these, too, is to pass them through the compost heap, though commercial growers sometimes prepare baled straw by leaving the bales outside in a single layer exposed to the weather and watered occasionally. In a year the straw changes colour, becomes dark brown and rotten, and is then suitable for using in the garden.

Plant Foods

It is well known that plants need considerable amounts of three materials, nitrogen, phosphorus, and potash. Each plays its own important part in nutrition and plants short of any one of these foods will not grow properly. Moreover, if one food is deficient the shortage can be made good only by adding more of that particular type of food; no amount of another type of food will make up for the one that is deficient. For instance, if the soil lacks phosphorus, no amount of nitrogen or potash will remedy the deficiency.

Nitrogen is needed by plants to produce good foliage. Insufficient nitrogen results in poor, spindly growth and small yellow leaves, and an overdose (if there is no other limiting factor) can produce too much foliage at the expense of the flowers. For flower borders a slow-acting form of nitrogen such as blood and bone is much to be preferred to the quick-acting sulphate of ammonia or nitrate of soda.

Phosphorus helps plants to make more roots and recover quickly from transplanting. Most short-lived plants seem to take up the bulk of their phosphorus requirements in the early part of their life, hence the importance of a dressing of superphosphate when sowing seeds outdoors or mixing seed-sowing composts, as a great many New Zealand soils are seriously deficient in phosphorus.

Potash is regarded as important for flower production and the general health of the plant, but is present in adequate quantity in many soils in the Dominion. Potash deficiency often shows as a scorching of the margins of the leaves, but marginal leaf scorch can also have other causes. The use of potash on flower borders is not likely to lead to spectacular improvements in most New Zealand soils.

Compost contains a proportion of all these three important foods, but usually not enough to maintain the food reserve in the soil at the required level. There is a continuous though gradual loss of plant foods from the flower borders as they wash into the drains in wet weather or are removed in flowers which are not returned through the compost heap. The loss can best be made good by the purchase of these chemicals in the form of the so-called "artificial" fertilisers and such concentrated animal residues as blood and bone.

To make sound suggestions about the quantities of these plant foods required to satisfy the plants' needs is not easy. On the other hand, too heavy applications may be wasteful or even dangerous to plant health. The plain fact is that knowledge about flower garden manuring is still very sketchy, as far less experimental work has been done on flowers than on vegetables or fruit.

Vegetable Water Is Valuable — Don't pour it down the drain!

VEGETABLES. (The green varieties in particular) are some of our richest food sources of minerals and vitamins and which are necessary for the growth and wellbeing of the children, and maintaining good health and vitality in adults. However, these nutrients are soluble in cooking water and unless this water is used there is an unnecessary loss of a large proportion of the food value of your vegetables.

Vegetables are expensive. Why permit money to be tipped down the sink . . .

1. Use as little water in the cooking of your vegetables as possible because (a) there is then less liquid into which the minerals and vitamins may be dissolved. (b) you will not have remaining more liquid than you can reasonably use up in cooking.
2. Use as stock in the making of soups, stews, casseroles, gravy and sauces rather than water.
3. Give it to the children to drink.
4. Keep in a jug, jar or bowl in a cool place such as a safe or refrigerator.



Issued by The Department of Health

1/47

Complete Flower Border Fertiliser

The following mixture contains the plant foods likely to be beneficial to flowers in gardens of average fertility in most parts of the Dominion:—

Blood and bone 3 parts by weight;
Superphosphate 2 parts by weight.
Muriate of potash 1 part by weight.

It is recommended that this be used annually in the spring on all flower borders (with the exceptions noted later) at the rate of 2oz. a square yard, dug into the border where any ground is bare or worked into the soil as a topdressing between growing plants.

The best plan is to measure all the flower borders, find out the total area, work out the amounts of each fertiliser needed, buy them separately, mix them thoroughly, and then spread the mixture evenly over the whole of the flower borders, taking care not to let the fertiliser fall on to the leaves or crowns of plants in the border.

The exceptions to this rule are:—

1. In very fertile "recent" soils such as the deep silts of the Hutt Valley, Heretaunga Plains, and Motueka the ground is often so rich in plant foods that flowers will not respond at all to fertilisers. Fortunate gardeners who have these soils could find out, by a small-scale trial, whether it is worth their while to use the fertiliser.

2. Similarly, where highly-farmed pasture or market garden land has been subdivided recently fertiliser will probably not be needed for flower growing during the first few years until some of the original fertility has been lost.

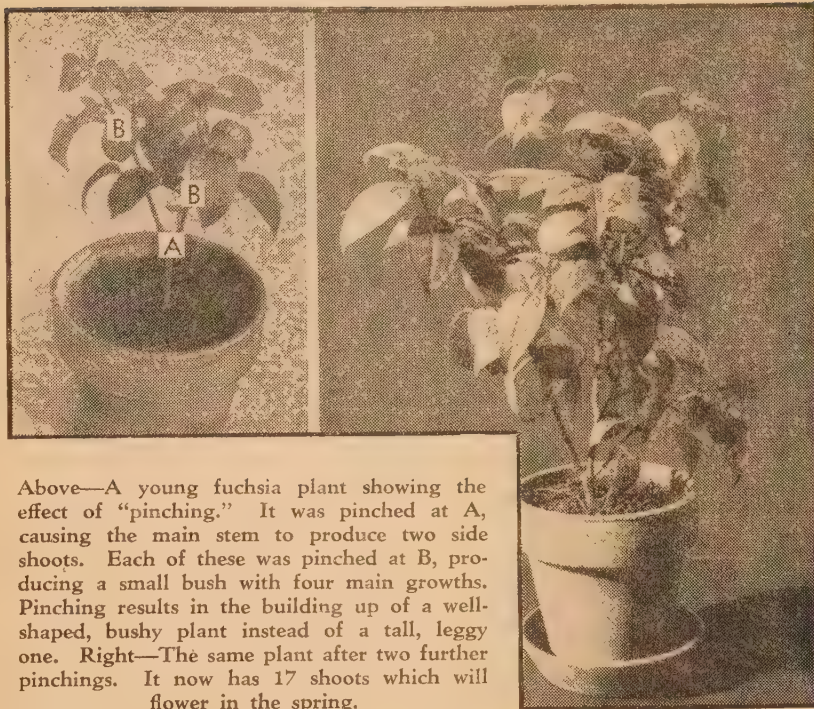
3. Many soils in New Zealand are fairly well supplied with potash and in these cases the potash component of the moisture could be omitted. However, to include it is a useful insurance, especially where the soils are shallow or sandy.

The Minor Elements

A great deal has been heard in recent years about boron, magnesium, manganese, zinc, and a number of other so-called "minor elements." These are known to be essential to the health of certain plants but are required in only very small amounts.

A New Zealand diet consists of foods from many other sources as well as from the home garden. If household scraps are put on the compost heaps, the compost will contain traces of a wide range of chemicals, including the minor elements, and deficiencies of these elements are not likely to limit the growth of flowers in a compost user's garden. In any event, so little is known about the need of flowers for the minor elements that at present no definite recommendations could be made about their use.

EFFECT OF "PINCHING" FUCHSIAS



Above—A young fuchsia plant showing the effect of "pinching." It was pinched at A, causing the main stem to produce two side shoots. Each of these was pinched at B, producing a small bush with four main growths. Pinching results in the building up of a well-shaped, bushy plant instead of a tall, leggy one. Right—The same plant after two further pinchings. It now has 17 shoots which will flower in the spring.

To sum up, manuring the flower borders requires the addition in practically all soils of some form of organic matter to keep the soil in good physical condition, capable of holding moisture in dry weather, and with the good "crumb" structure that plant roots love. Little more will be needed in the richest, most fertile soils, but some additional plant food in the form of a complete fertiliser will be worth using in borders which have been growing flowers for a few years, and especially in old gardens where the soil has lost its original fertility.

The flower gardener who wants to keep his borders bright and cheerful need not be concerned with the compost versus "artificial" manure controversy, as each has its part to play. As a world authority recently said: "From the point of view of progress no basis for discussion could be less profitable, for it is at least a mid-Victorian point of view to regard manures and fertilisers as competitors for the same job."

Each autumn the gardener should take stock and ask himself whether the season has been successful. If there have been disappointments and the borders did not come up to expectation, was that because the soil lacked humus or the plants lacked food?

Conclusions

This concludes the series of five articles on the rules of good flower

gardening. These rules, each of which has been dealt with in detail, are:—

Feed the flower border (this issue).

Never miss an important sowing or planting date (February, 1948).

Give young plants ample room in which to develop (March, 1948).

Do not let weeds compete with the flowers (October, 1947).

Where necessary, stake or support plants in ample time, before they are blown over (January, 1948).

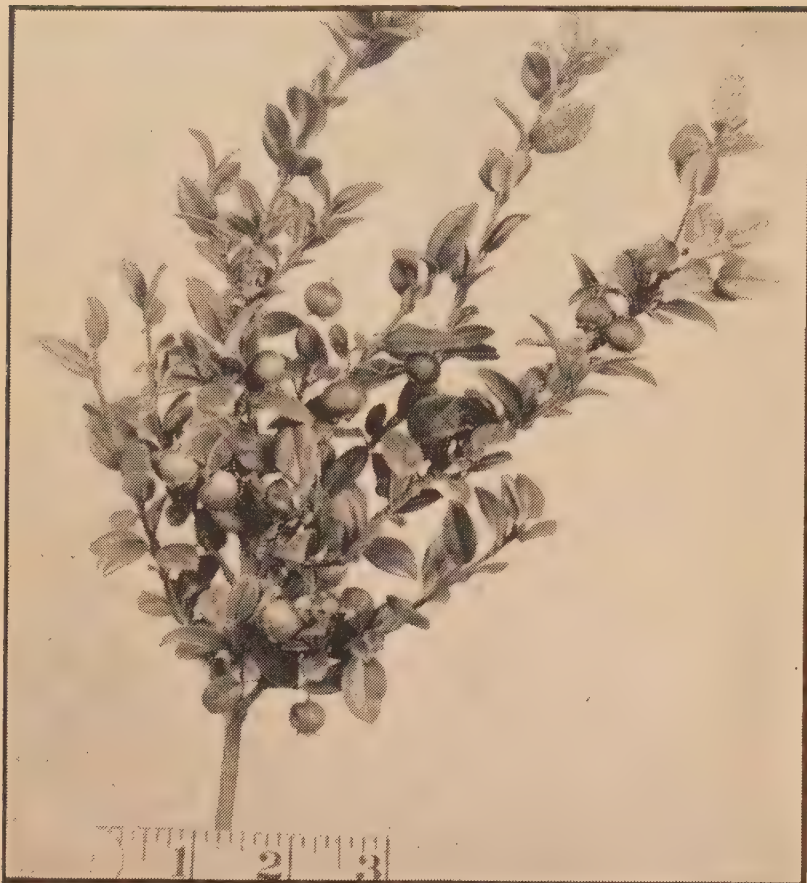
Pick off dead flower heads regularly (December, 1947).

Following of these precepts will enable flower borders to be kept bright and colourful all the year round in the milder districts and for most of the year elsewhere. Each garden can thus make its full contribution to the general appearance of streets and roads, improve the amenities of the towns and countryside, and provide the householder with a healthy hobby in which there will be fewer failures in a garden always full of flowers.

Garden Work for May

Annuals sown earlier for spring flowering should be thinned out to an inch or two apart as soon as they can be handled. Further thinning is necessary as the plants become larger, until they are finally thinned to 8 or 9 in. apart by the time they are in flower. Annuals that have been raised in boxes from seed, or self-sown seedlings

WORK IN THE FLOWER GARDEN



The New Zealand cranberry (*Myrtus ugni*) is a small evergreen shooting bush that can be grown in fairly exposed places where most small fruits would be a failure. The prolific crops of fruits can be used stewed or as a sauce.



One of the neatest edges for a garden path can be made with old bricks, laid with a line, with the soil under and on each side of the bricks hammered hard. Properly laid, a brick edge needs no further attention for years.

[Photo News Ltd. photo.]

lifted from the borders, can still be planted out in vacant spaces in the borders in very mild districts, but elsewhere it is probably better not to plant these seedlings out until the end of winter.

Cinerarias should be looked over from time to time. If leaves show small holes, the caterpillar responsible for the damage should be sought. The brown, hairy, "woolly bear" caterpillars that can devastate cinerarias later in the season can usually be kept down by hand picking at this time, but spraying with lead arsenate in the spring and early summer is well worth while to control this pest.

Chrysanthemums are usually left in the border from year to year in the milder districts, but the modern varieties are not truly hardy and where sharp frosts are experienced it is safest to lift the stools in autumn, label them, and plant them in a cold frame for the winter. Little water or attention need be given through the winter, but these plants will provide a good supply of cuttings when required for propagation later.

Cuttings will form new roots only if there is a continuous supply of air to the cut surfaces, where the new roots will appear. Success with cuttings depends, among other things, on the texture of the soil in which they are put to root. Silty soils, such as those in many New Zealand gardens, "run together" when watered and then form a crust when they dry. The more often they are watered the tighter this crust becomes and the more difficult it is for air to pass through it. Cuttings in a pot, box, or frame have to be damped down often until they root, and they root badly in a silty soil because the supply of air to their roots is insufficient. Now is the time, when the cold frame is more or less empty, to make sure that the texture of the soil in it is suitable for propagating. A liberal addition of coarse gritty sand will do much to open the texture of the soil, prevent it from caking when watered, and so ensure a good supply of air to the base of the cuttings to be propagated next season.

Dahlias left in the ground from the previous year produce the earliest blooms, but they cannot be left outdoors in districts which experience hard winters, and are also very likely to rot if the ground becomes waterlogged. Except in the mildest districts, it is safest to lift the roots and dry them off as described last month, then store them for the winter in any place where they will be protected from frost. They do not require a warm place—in fact, provided the store is frostproof, the cooler the better, as the tubers shrivel least at temperatures between 35 and 40 degrees F. In relatively-mild districts the roots can be kept beneath an evergreen hedge if shed storage is not

available, but that would be risky in cold inland places which experience hard frosts. Even in mild districts where it is customary to leave dahlia roots in the ground through the winter it is advisable to lift them in late winter at least every three years and divide the old roots or replant single tubers taken from the outside of the old clump, making sure that each tuber has at least one bud on its neck.

Dead flower heads should be removed regularly even in the winter if the borders are to be kept in flower for as long as possible each year. They should always be cut off with a knife or scissors or pinched off with the thumb nail, and never pulled off, as pulling is likely to wrench the roots and may even result in some of the annuals being pulled out of the ground. Dropping the faded heads into a bucket and putting them on the compost heap is tidier than leaving them lying on the borders, quite apart from the great value of the compost to the gardener.

Deep digging does more than anything else to encourage the large, deep root systems which are necessary if plants are to grow well. Plants with shallow roots are sensitive to dry conditions when the surface soil dries out, whereas deep soils remain moist for much longer and roots can draw a constant supply of moisture from the deeper layers. In the mixed border there is less opportunity for deep digging than in the vegetable garden, but every opportunity should be taken of digging the borders, even though only small areas can be dug at a time. The soil should be turned over as deeply as possible, provided the lighter-coloured subsoil is not brought to the surface except in very small amounts at a time. Digging in the autumn is especially beneficial, as rain soaks more readily into soil that has been broken up, and much badly-needed moisture will run off the surface instead of soaking into the soil if the

flower border is left with a hard surface through the winter. All hard surfaces should now be pricked lightly with a fork even if the ground is occupied and cannot be dug over. Many New Zealand soils contain a high proportion of silt, which is why the surface often "runs together" when rain falls, leaving a crust that hardens when it dries. The aim should be never to let the ground become hard but to loosen the surface whenever it shows signs of caking to make sure that rain can soak in instead of running off to waste.

Herbaceous plants in the borders should continue to be lifted, divided, and replanted after the digging and manuring of the site. Only by dividing old plants and discarding a big proportion of the roots can the strongly-growing types of herbaceous plants be kept in good condition.

Paths infested with weeds can be cleared effectively by spraying with an arsenical weedkiller. This can be made up at home by mixing two parts of white arsenic and one part of caustic soda in a large container. Add water to the dry mixture, which rapidly heats up until it boils. Finally add 10 gallons of water for each pound of white arsenic in the mixture, and spray the liquid thinly but evenly on the path so that each gallon of the mixture covers about 20 square yards of surface. The treatment usually gives a good kill of weeds and remains effective for some months. Arsenic is, of course, intensely poisonous and proper precautions must be taken in mixing the spray, using it, and cleaning out the utensils afterward. White arsenic is dangerous if inhaled and users should avoid breathing in any of the powder.

Planting time for most trees, shrubs, and herbaceous plants extends from about the end of April to early October. The best planting time is one of the topics about which gardeners love to argue. Briefly, the advantages of autumn planting are that the soil is still relatively warm after the summer and plants usually form new roots quickly. The cool, moist conditions of winter are least trying to newly-planted stock. On the other hand, winter storms are likely to rock shrubs and trees planted in autumn, as they will not have had time to produce new anchorage roots, and a very wet spell in winter will often kill newly-planted stock outright if the soil is poorly drained and becomes waterlogged. In spring planting there is likely to be less trouble from wind rocking, or waterlogging by heavy winter rains, but the plants will have less time in which to form deep root systems before the arrival of hot, dry summer weather.



GARDENING CAN BE DANGEROUS But Most Hazards can be Avoided

THIS is a dangerous age and dangers lurk even in the garden, but there are some hazards which should be avoided. Two recent accidents emphasise the need for proper care in the home garden.

Child Poisoned

In Britain a child was playing with an apparently empty bottle that had contained nicotine. A little of the material had crystallised round the neck of the bottle and these crystals were evidently tasted, causing the child's death in a few minutes.

Too much care cannot be taken with poisons and the containers in which they are packed. No doubt in time the home gardener will be able to rely entirely on non-poisonous therapeutants for controlling diseases and pests in the garden, but until then all poisons should be kept under lock and key and empty containers destroyed at once.



Man Badly Cut

A man clearing out dead leaves from beneath his front garden hedge cut his hand very badly on a jagged piece of broken glass—part of a beer bottle left by a previous tenant. It is astonishing how careless people are with glass and how many garden soils are full of splinters of glass and pieces of broken crockery. These things never rot away or disappear but remain indefinitely in the soil as eyesores and menaces.



The rubbish bin is the proper place for broken glass and pottery, and the way to rid a garden of this nuisance is to pick up every piece as soon as it is seen and put it in the rubbish bin, disposing of it once and for all. When taking over a new section where the garden is full of broken glass it is a good plan to put here and there through the garden a number of tins into which the pieces can be put as they are picked up and kept together until they can be dumped in the rubbish bin. That is easier than having to make a trip to the bin each time a piece is picked up.

It is a gardener's duty to those who will tend the garden after him, and to the children who will play there, to rid the soil of this broken glass menace and to teach children that it is not amusing to shy at bottles and leave broken glass in gardens, on the seashore, or anywhere else where it will remain as a permanent danger to fellow human beings and to animals.

WORK IN THE FLOWER GARDEN



Kentias and other palms do not require frequent repotting, but the pots become dirty after a time and should be scraped and scrubbed to freshen them up.

On balance it is suggested that autumn planting is best on well-drained soils and spring planting if the soil tends to be wet in winter, but it is hoped that this interesting subject can be dealt with more fully in a later article.

Pot plants should be trained as bushy specimens and not allowed to become leggy. Young fuchsias, balsams, and geraniums potted up as rooted cuttings to flower next year should be "pinched" several times as they grow to produce well-branched plants. "Pinching" means the removal of the tip of the shoot while it is still soft enough to be pinched off between the finger and thumb nail.

Sweet peas should be given as long a growing season as possible. In early districts where the site will be ready for planting by July or August seeds should be sown now in pots or boxes in a cold frame. They should be given quite hardy conditions, and need the protection of the frame light only in really cold weather. Seeds are sown 1½ in. apart, with black seeds 1 in. deep and others only ½ in. deep.

Reminders About Common Troubles

Chrysanthemum plants are often affected by eelworm, which results in the leaves drying prematurely and shrivelling. This pest can be controlled properly only by hot water treatment of the stools in winter and planting them in sterilised soil. Cuttings from plants treated in this way will be completely free from eelworm. If planted

in soil not affected with eelworms these plants will grow into fine, healthy specimens retaining all their leaves to the ground. Full details of the hot water treatment and other aspects of disease and pest control were given in the July, 1946, and July, 1947, issues of the "Journal."

Mildew on a variety of ornamental garden plants can best be controlled by a sulphur fungicide. The most effective method is to use a liquid

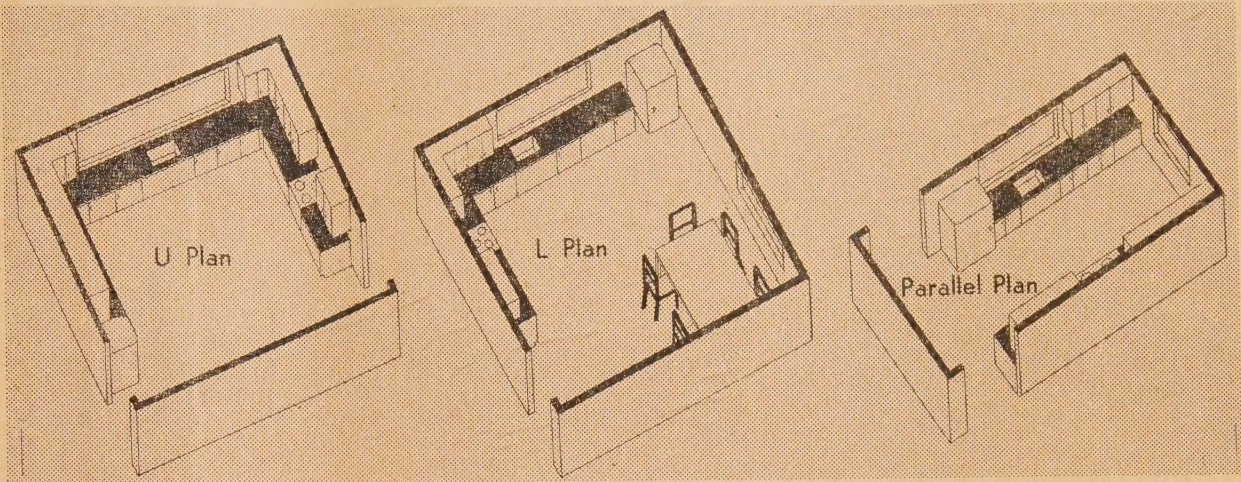
spray such as lime sulphur, colloidal sulphur, or, best of all, a combination of the two, but the use of sulphur sprays is limited seriously in the flower garden by the fact that all these liquids discolour paint work and cannot be used safely near the house. A fairly-satisfactory method of combating all the common mildew diseases on flowering plants is to use sulphur in the form of a dust—either flowers of sulphur or a proprietary sulphur dust. Dusts are not as efficient as liquid sprays but are reasonably effective if applied very uniformly, preferably in the early morning when the plants are still damp with dew. One method of application is to put the dust in a piece of cambric, tie the bundle to a stick, and shake the stick or tap it with another to drive off a small cloud of the dust. However, that is a wasteful method, and every home gardener will find that a hand duster is a good investment. Several patterns of hand dusters are on the market and some notes on their uses appeared in an article by A. G. Kennelly on page 477 of the November, 1947, issue. The rate of application should be adjusted so that all the foliage is coated with a film of dust just visible and no more.

Spotted wilt virus disease of tomatoes is carried over from one year to the next on a variety of plants, especially on dahlias, lettuces, Iceland poppies, and nasturtiums. Do not fail to dig out and burn dahlia roots marked earlier as virus infected, and any of the plants named which show spots on the leaves or are stunted, malformed, or in any way abnormal. By rigorously killing infected plants that are carrying over the disease from year to year there is at least some hope of reducing losses in next season's tomatoes.



[Photo News Ltd. photo.]
One way of applying dusts—though a wasteful one—is to put a little on a piece of cambric, tie the bundle to a stick, and shake it or tap it with another stick to drive off a small cloud of dust near the plant being treated.

Making the Kitchen Convenient and Efficient



PREVIOUS articles in this series by Norma K. Metson, Rural Sociologist, Wellington, have discussed in detail the kitchen and its equipment. In this article she explains how the various items which have been described should be examined and those which are required for any particular kitchen selected and arranged to make a convenient and efficient room. The location of the kitchen in relation to the rest of the house is also dealt with, as dining space, back entrance, and laundry must all be near at hand, forming the work area and centre of the housewife's activities. Depending on the needs of the household, store-rooms, dairy, cellar, second bathroom, or a room for an employee may also be required.

AS the kitchen and related areas include so much of the fixed equipment and the services which require permanent installation, it is not illogical to plan the house round them. Other rooms are more flexible in use, in siting, and in the furniture they must be planned to hold. Every kitchen has a stove, but not every living room will have a piano, and it is the element of uniformity in work done and equipment needed which makes generalisation about kitchen planning possible. A kitchen should be a pleasant place because the housewife spends so much time there; it should also be convenient, so she will not have to spend more time than is necessary tied to kitchen tasks.

A successfully-planned kitchen minimises the distance the housewife must walk. Long trips outdoors to the safe, from kitchen stove to scullery sink, and from pantry to dining table add up astonishingly to miles walked in a

day and time and energy wasted. Work centres brought together will eliminate this. Work is much easier, too, if necessary movements, especially reaching, stooping, and lifting, are at a minimum. This is the principle which underlies the planning of the work centres which have been described in previous articles, and recent research is moving even further in the direction of measuring and planning storage so that the hand can reach for any article as automatically as it now grasps the oven-cloth or tea-towel.

Avoiding Cross-traffic

There are often two or even three workers in a farm kitchen, all of whom need room to work and move about independently, but nothing is more annoying to the housewife than to have her work hindered by people squeezing past on their way to the bathroom, sunporch, or laundry. The kitchen work area should be arranged so that it is unbroken by doors which cause cross-traffic. If the house is planned so that the kitchen must be used as a passageway between the back door and the rest of the house, all doors should be kept at one end of the room. It is not uncommon for old houses, particularly those which have been enlarged, to have five or six doors opening from the kitchen; alterations should be planned to avoid this. Direct access from kitchen to back door is desirable, and if there is a dining room regularly used for meals, the communicating door should open near the stove and serving bench.

To provide a pleasant as well as an efficient work place, view, sunshine, and fresh air must be available. Morning sun in the kitchen or on an adjoining verandah is generally liked, but a northern aspect which receives the full force of the midday sun is to be avoided for the main windows. If the main meal is served in the evening, or the kitchen is much used for sitting about, some afternoon sun is pleasant. A small

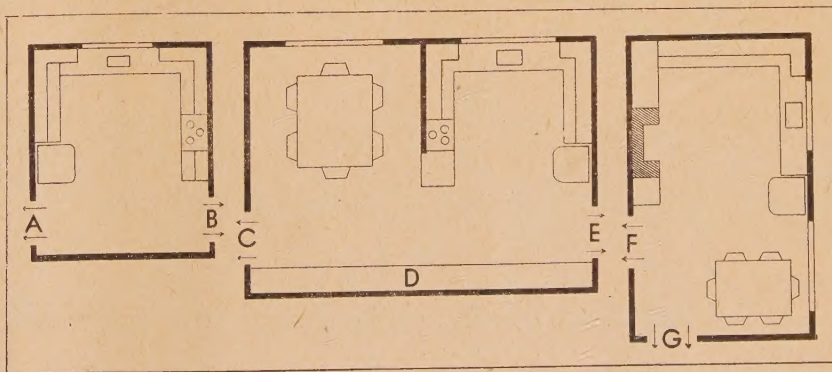


Fig. 1—U plan for small and large rooms. A—Back entrance. B—dining room. C—Rest of house. D—Storage wall. E—Back entrance. F—Rest of house. G—Back entrance.

KITCHEN PLANNING . . .

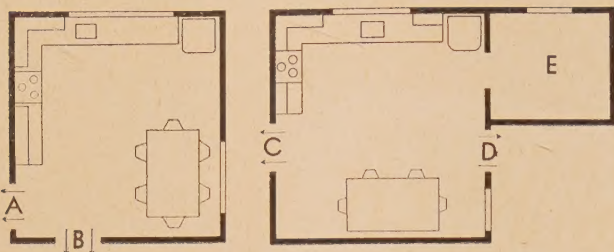


Fig. 2—Variations of the L plan. A—Rest of house. B—Back entrance. C—Rest of house. D—Back entrance. E—Storeroom.

working kitchen warmed by a fuel or heat storage range may be quite satisfactory facing south, but would not be recommended except for very hot districts. Windows on two walls are excellent for light and cross-ventilation. One or two floor-ceiling cupboards elsewhere in the room will compensate for wall storage lost through putting extra windows above the work benches. A kitchen with only one outside wall can be built on the U-alcove plan, allowing a window above the sink and another to provide sunshine and view for the dining area. The window should provide some outlook more pleasing than the wall of the garage, and personal preference will decide whether the view is to be that of distant hills, the road and drive, or the trees and garden, for not everyone can live on a hilltop and it may be necessary to create the scene after the window has been built.

Arrangement of the equipment will be according to one of the three basic plans U, L, and parallel. All these groupings are convenient, and with slight adaptations can meet all situations. It is helpful to think along these lines when altering an old room, and the size and shape of the kitchen planned for a new house will depend largely on the preferred placing of equipment.

U Plan

The U plan, sometimes spoken of as the ideal kitchen arrangement, requires space on three walls. The sink is generally put in the central position at the bottom of the U, but may be on any wall, and the stove should be on the wall nearest the dining room or meal table. The continuous line of benches and cupboards gives this arrangement a very pleasant appearance and eliminates hard-to-clean corners. Unless some device such as corner angle or circular cupboards is adopted, the storage space at the corners of the U is inaccessible. The arms of the U may be made any length desired to give adequate storage and work space; 10ft. overall width allows room for two workers, but does not make too much walking to and fro. The smallest possible U has a bench along the base wall only; the range forms one arm and the refrigerator or storage cupboards the other. Fig. 1 shows the basic U as it would be in a small working kitchen and adaptations to a larger room with provision for a dining table.

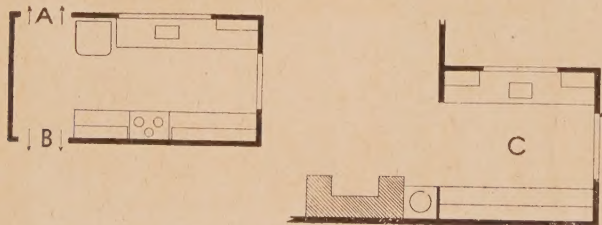


Fig. 3—A working kitchen and a modernised scullery with parallel-wall arrangement of fittings. A—Back entrance. B—Dining room. C—Former scullery.

L Plan

The L plan has continuous work surfaces and equipment placed on two adjacent walls. One of these should be an outside one, and here again the sink is generally placed beneath the window. As all equipment is on two walls, a fairly-large room is necessary to provide the required amount of wall space. The work area is compact and free from traffic, the remainder of the room is available for the dining table, and there is plenty of space for other activities such as children's play. A consolidation of equipment on these lines is often possible in an old kitchen, with perhaps a door to pantry or storeroom left at one end of the L (Fig. 2).

Parallel Plan

The parallel or corridor arrangement with sink and range on opposite walls is step-saving, provided the room is not wide (Fig. 3). Doors may be at each end, though this will make draughts and traffic troublesome, and it is preferable to have both doors at one end. The window above the sink must be wide, or an additional window or glass-topped door installed at one end to secure adequate lighting for the stove. With this type of plan an up-to-date kitchen can be made having a small scullery or storeroom opening from the main room.

It is usual and highly desirable for a laundry, veranda, or vestibule of some kind to be placed between the kitchen and outdoors. The feeling is also fairly general that as people come into the kitchen anyway, it may as well be

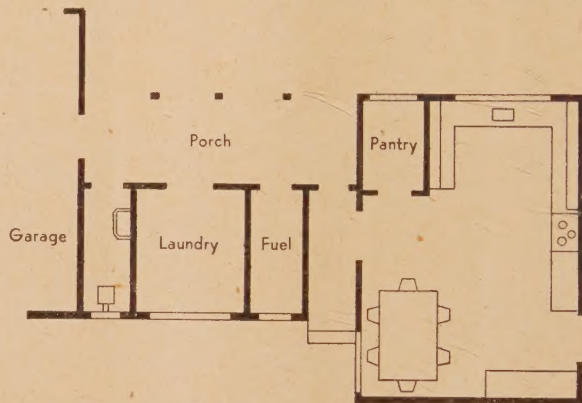


Fig. 4—A convenient relationship between kitchen and other service rooms.

used as the route to the rest of the house and the back passage which would give direct access dispensed with. Fig. 4 shows how this may be achieved without inconvenience to the housewife and also illustrates an arrangement for having all the necessary service rooms available and under cover. The attached garage is a very convenient feature for country homes, where practically all transport of supplies and people is by car.

"USEFUL FACTS AND FIGURES FOR THE KITCHEN"

IN the article "Useful Facts and Figures for the Kitchen," published in the February issue of the "Journal," it was stated in the footnote under the table on page 202 that "4 of flour : 1 of liquid by weight for all pastries." This should have read "4 of flour : 1 of liquid by volume for all pastries."

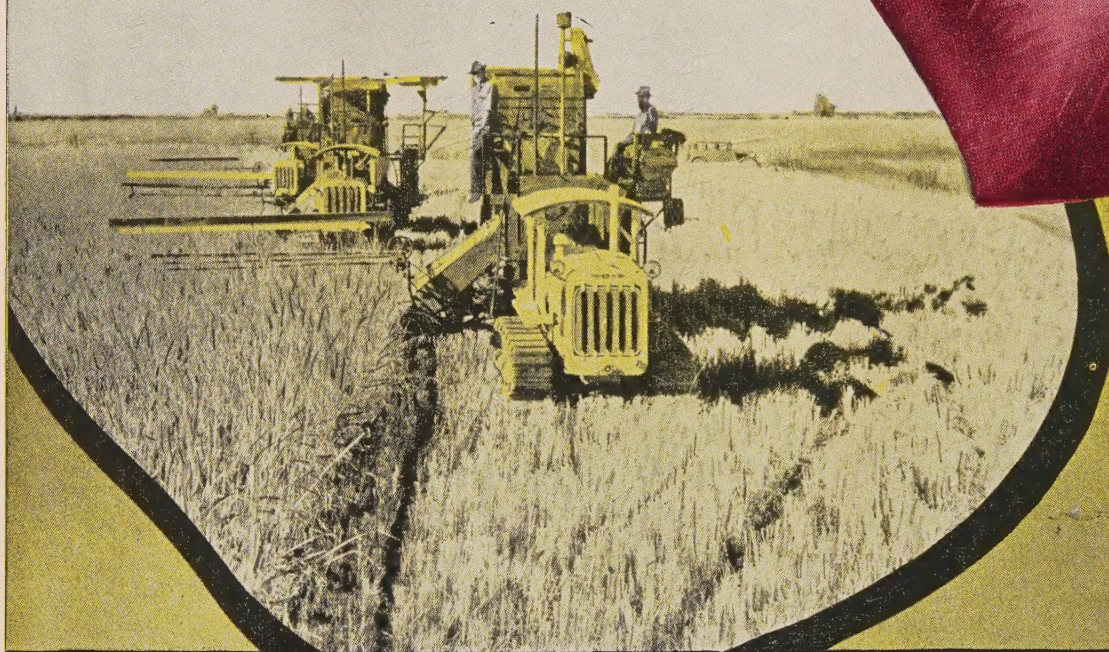
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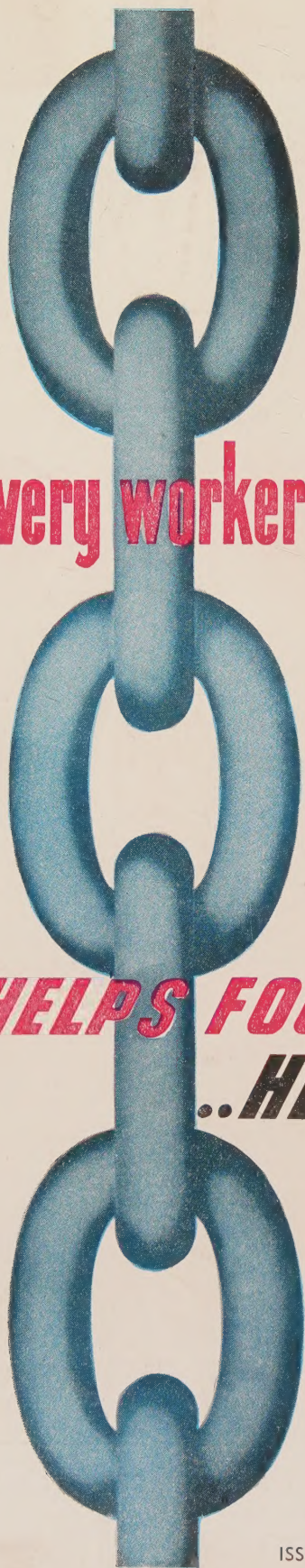
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